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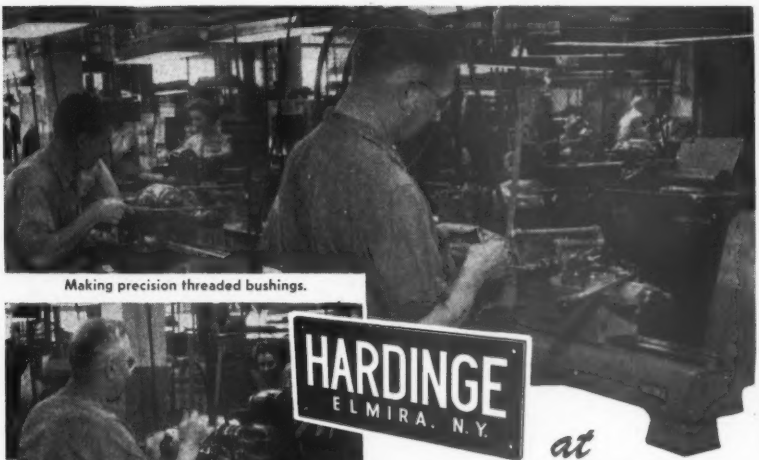

Making precision threaded bushings.

Turning angle face of generator rings to length.

Facing retaining rings.

HARDINGE
ELMIRA, N.Y.

at

JACK & HEINTZ, Inc.

Since 1917 Bill Jack has been heading companies which manufactured precision parts, so it was only natural that Hardinge lathes were selected for precision operation at Jack & Heintz, Inc. of Cleveland.

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HARDINGE BROTHERS, INC.
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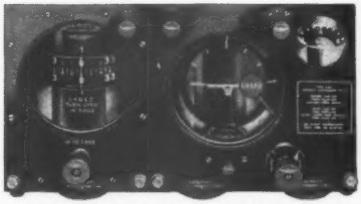

Jahco automatic pilot which keeps the plane level and on the course set.

TOOL & DIE JOURNAL

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CHARLES H. HAYNES
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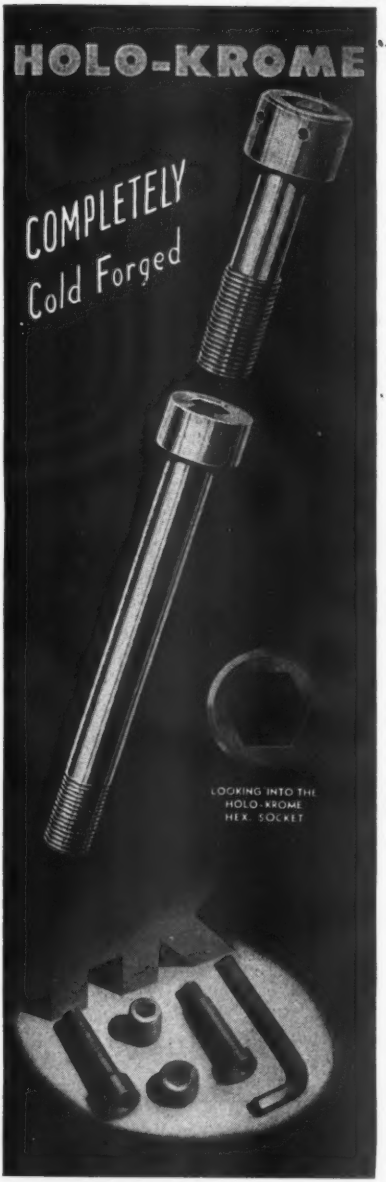
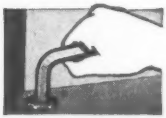
HOW NEAR is "JUST AROUND THE CORNER"?



No one knows. The alert manufacturer plans today, for the arrival of "the corner" by making tests of the parts which will be used eventually in his products, by investigating the better and more advanced methods and processes — yes, he is preparing for the day Post-war production will be an actuality. Design and Production Engineers see a vast, new market opened to them for the fulfillment of their stored-up ideas and creations and they are acting, now, with definite plans for it. Are you?



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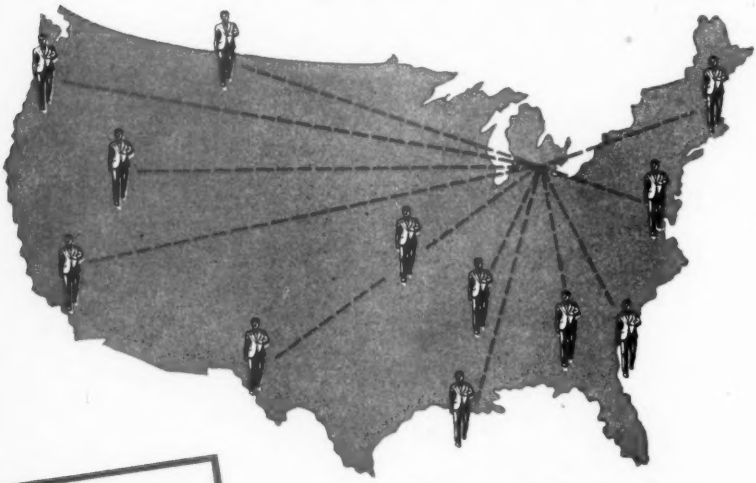

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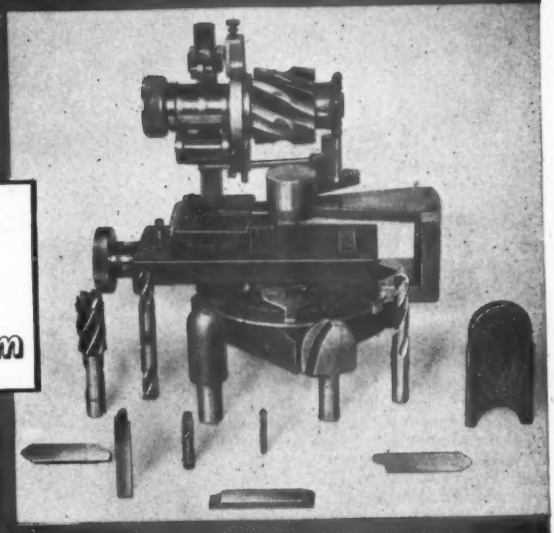

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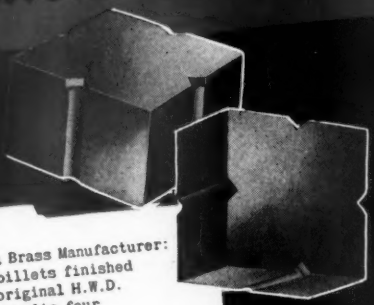
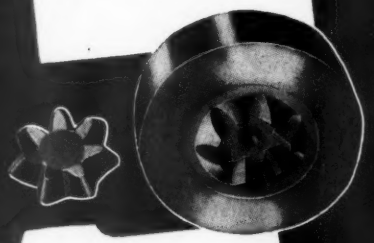


from a Brass Manufacturer: "1200 billets finished with original H.W.D. die. Results four times greater than with any other steel."

from a Forge Company: "operating record on H.W.D. tests shows 7000 above average of any other steel."



from an Equipment Company: "H.W.D. punches running over 50,000 holes in housings, and still running. Best previous record with other steel dies 20,000 holes."

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For Hot Work

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The Firth-Sterling line includes six other hot-work die steels

Firth-Sterling
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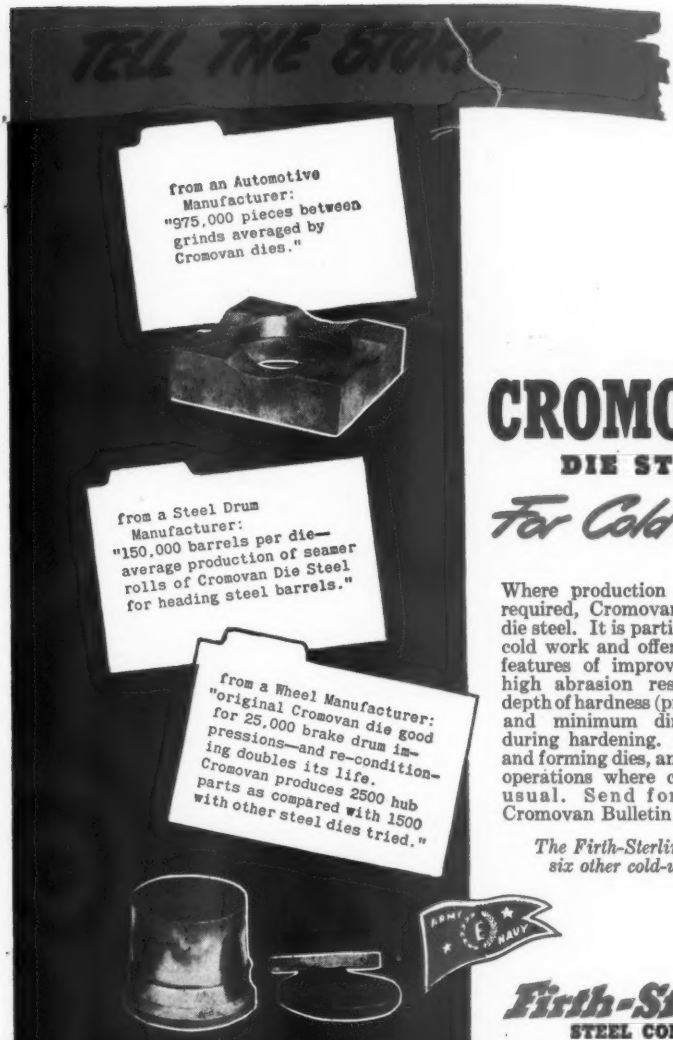
TELL THE STORY
from an Automotive Manufacturer: "975,000 pieces between grinds averaged by Cromovan dies."
from a Steel Drum Manufacturer: "150,000 barrels per die—average production of seamer rolls of Cromovan Die Steel for heading steel barrels."
from a Wheel Manufacturer: "original Cromovan die good for 25,000 brake drum impressions—and re-conditioning doubles its life. Cromovan produces 2500 hub parts as compared with 1500 with other steel dies tried."
ARMY
NAVY

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DIE STEEL
For Cold Work

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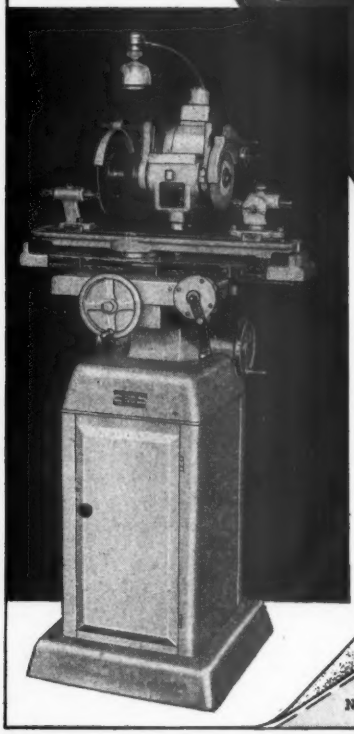
NINE OPERATING SPEEDS
1,100 to 11,000 R. P. M.



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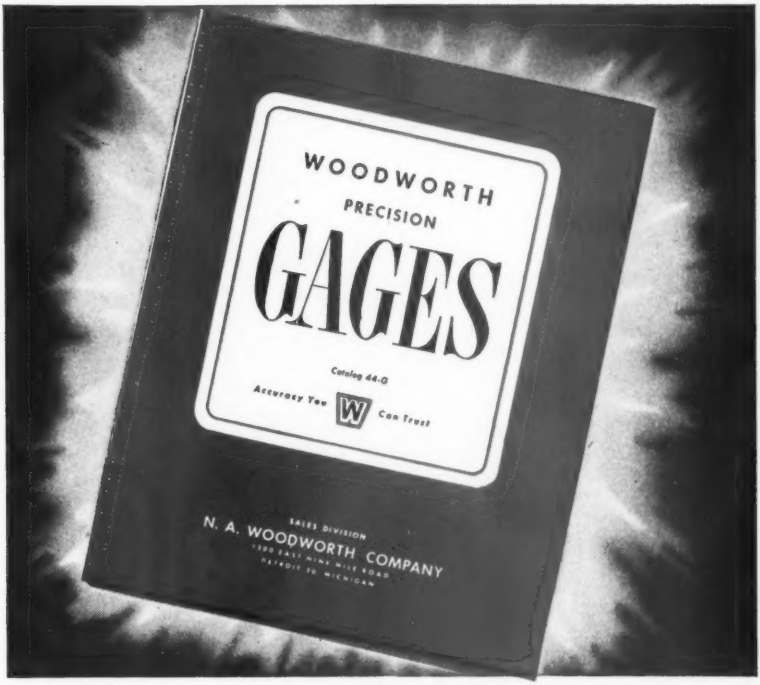

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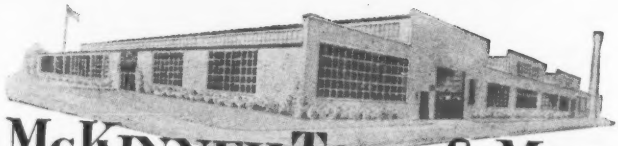

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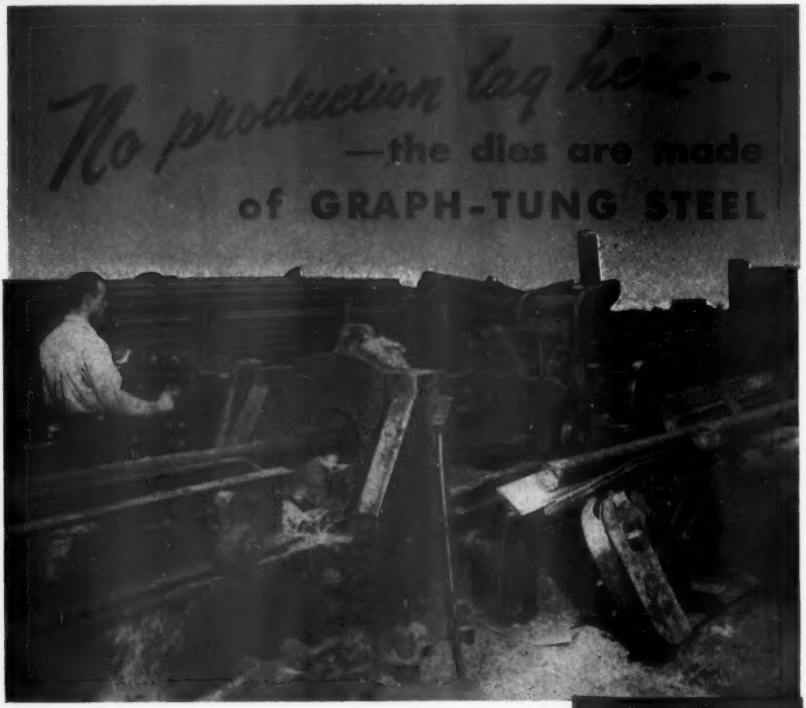

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3. Fasten three screws — and it's mounted on your die set.

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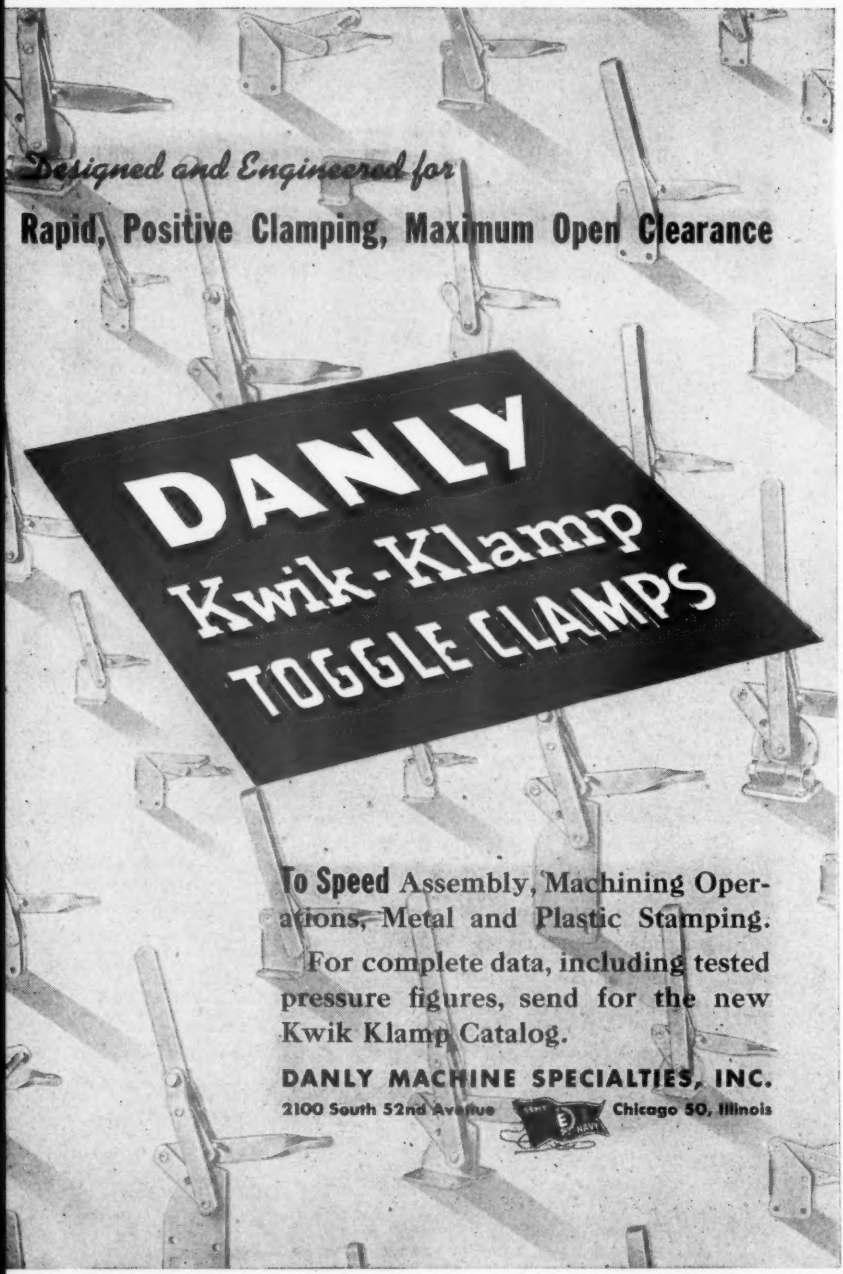
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IN SWEDEN, before the turn of the century, Hjalmar Ellstrom, father of Elmer Ellstrom, the present head of the Dearborn Gage Company, built the first known gage blocks to accuracies of millionths of an inch.

That same Ellstrom was the production genius of the first company ever to sell master gage blocks commercially.

Today, his son and grandsons are carrying on in his footsteps by making gage blocks for industry throughout the world. In fact, they were the only ones to make a major improvement on Hjalmar Ellstrom's original gage block by successfully chromium plating the gaging surfaces of their blocks to increase their wearing qualities.

Yes, in three generations, craftsmanship in millionths of an inch has become a tradition with the Ellstrom family. This has prompted the writing of a booklet entitled, "The Saga of Ellstrom". It tells the complete story of the development of the gage block. Your copy will be sent you upon request, just write the Dearborn Gage Company, 22038 Beech Street, Dearborn, Michigan.

HJALMAR ELLSTROM

ELMER ELLSTROM

OLOF ELLSTROM

Ellstrom

3 GENERATIONS of GAGE MAKERS

ELMER ELLSTROM II

RALPH ELLSTROM

DEARBORN GAGE CO.

22038 Beech St. Dearborn, Michigan

Originators of Chromium Plated Gage Blocks

"HARDSTEEL"

THE DRILL THAT AMAZED THOUSANDS AT THE METAL CONGRESS SHOW DRILLING FILES

During the last few years, "HARDSTEEL" drills have amazed thousands in industry too—drilling, countersinking and counterboring hardened steels with the same facility that high speed twist drills exhibit on ordinary steel. Useful alike on production and parts recovery operations.

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Write for free copy of "HARDSTEEL" OPERATOR'S MANUAL.

Also inquire about "HARDSTEEL" as a metal. Many manufacturers are finding it ideal for special parts that must meet unusual conditions of service.

"HARDSTEEL"

DESIGNED FOR USE on flexible or stationary shafts, filing machines, portable electric and air tools and similar devices, Heller Rotary Files are high-speed production tools. They meet your needs for the faster cutting of metals, plastics and other materials.

The shapes obtainable satisfy every requirement. They range from cylindrical with flat or radius ends, spherical, elliptical and tree shapes to conical, flame, reverse-angle, semi-spherical convex, concave and other designs. Three cuts,—coarse, medium and fine.

Tell us your particular rotary file problem. Our engineers will be glad to cooperate in helping you solve it.

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America's Oldest File Manufacturers
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Awarded to the Newcomerstown, Ohio, Plant

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MACHINES from 500 to 21,000 lbs.

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Five Brothers . .

. . . and an Idea

It isn't often that an idea created in the minds of boys will materialize in later life. With the five Turner brothers, William*, Cort, Frank, Charles and Robert, their boyhood idea that some day they would be in business together, overshadowed all the obstacles of hard work and study to make this idea a reality. Finally in April, 1939, they purchased their first grinding machine and formed their own company. From this modest beginning they gradually won recognition among manufacturers for precision-built gauges. This recognition made expansion necessary, and today their company occupies one of the most modern buildings for the manufacture of gauges in the country. The TG stamped on a gauge represents a product backed by the integrity of five brothers and their practical knowledge of precision gauges.

*William Turner, of the U. S. Navy, was killed in action in the Coral Sea Battle.

The Stamp TG *of Precision*

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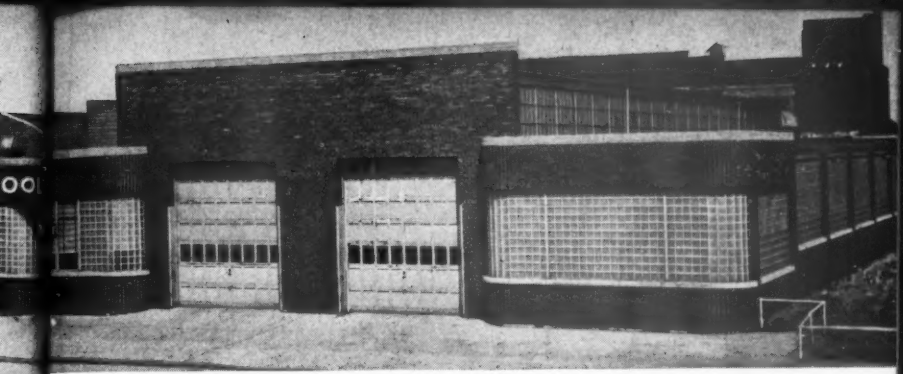

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Our modern facilities, both building and equipment, enable us to expedite manufacture of tooling components and precision parts . . . We invite your inspection.

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with all these features

1. Exclusive vise-grip jaw exerts 4-sided pressure evenly over *full* length of cutter channel, prevents sagging under-channels and broken bits.
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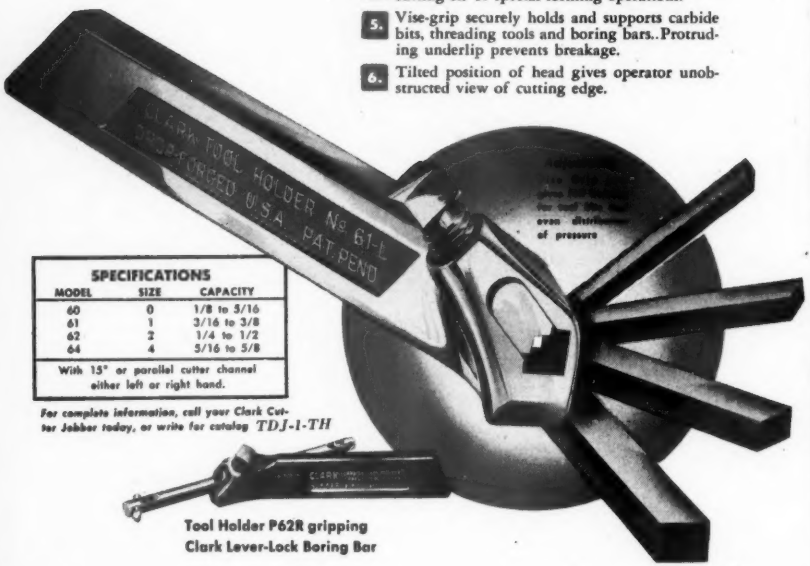
3. Vise-grip jaw clamps large heavy bits or short stub ends with the same rigidity as forged tools.
4. Dual and narrow tool bits are firmly held for cutting-off or special forming operations.
5. Vise-grip securely holds and supports carbide bits, threading tools and boring bars. Protruding underlip prevents breakage.
6. Tilted position of head gives operator unobstructed view of cutting edge.



SPECIFICATIONS		
MODEL	SIZE	CAPACITY
60	0	1/8 to 5/16
61	1	3/16 to 3/8
62	2	1/4 to 1/2
64	4	5/16 to 5/8

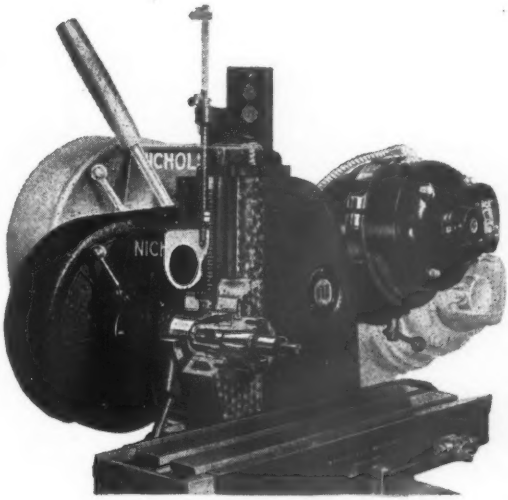
With 15° or parallel cutter channel either left or right hand.

For complete information, call your Clark Cutter Jobber today, or write for catalog TDJ-1-TH

Tool Holder P62R gripping Clark Lever-Lock Boring Bar

ADJUSTABLE CUTTING TOOLS FOR ALL MATERIALS

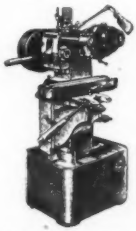
HOW ENGINEERED CONSTRUCTION GIVES NICHOLS RISE-AND-FALL SPINDLE *RIGIDITY PLUS MOBILITY*



Lock the Nichols Miller's rise-and-fall spindle head in any position and it is set as rigidly as a fixed spindle. Use it sliding-head fashion and equal rigidity is maintained, while at the same time providing the added advantage of mobility in operation.

That's because every part—from the cutter through the spindle, head, arm and motor—is precision engineered and *solidly joined to produce a "single-mass" effect.* This patented construction assures complete absorption of any shock starting at the cutter.

"THE MILLER THAT USES ITS HEAD"



Effective counter-balance enables the operator to move the sliding-head up-or-down to any position with little effort to bring the cutter to the work ...makes possible simple, rigid fixtures which reduce set-up time.

This unique Nichols combination provides chatter-free performance, the key to fine finishes and tolerances in "tenths."

Put the Nichols Miller to work for high-speed *precision* production.

THE NICHOLS MILLER ni

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. . . close tolerance machin-

ERICKSON Precision

RELATED TOOLS

accuracy of .0005 guaranteed

THE ERICKSON COLLET

Collapses 1/32 in. Maintains gripping strength and accuracy.

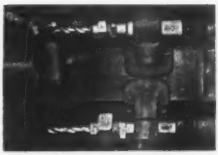
The Erickson Precision Collet Chuck is outstanding for its super gripping strength and ability to maintain accuracy.

Erickson Engineers regularly solve problems for many types of manufacturers anxious to improve results and profit by savings through proper handling of work.

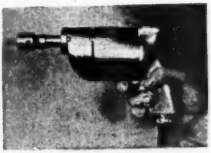
Uses and applications of the chuck to fit your requirements will gladly be recommended upon request.

ONE ERICKSON COLLET replaces at least 7 SINGLE PURPOSE COLLETS

Erickson chucks on main and auxiliary turrets.



Models 102 and 402 on Automatic Screw Machine.



Model 202 Chuck on Hand Drill —01 models generally used.

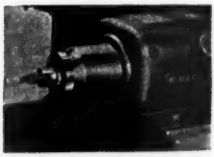
Model 102 holding woodruff Key Cutter on Horizontal Miller.

Model 502 Face Plate Chuck on Lathe—101 Chuck on Tail Stock.

Tool Post Grinder equipped with Model 301 Chuck.

Drilling Operation showing No. 301 handwheel production Chuck.

Model 101 Chuck with auxiliary Tool Head.



Model 301 Stubbed Chuck designed for high speed internal operations.

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COLLET CHUCKS and

ERICKSON EXPANDING MANDRELS

An outstanding development in a method for securely holding parts on their interior surfaces for accurate machining to close tolerances. Furnished in both cantilever and between center models — in varying types and variations.

Between centers 1A1 Mandrel with lathe dog for driving.

4A1 Face Plate Mandrel-Series Type with Stop. Locknut operated

2A1 Cantilever Mandrel. Morse Taper with tang.

ERICKSON FLOATING HOLDERS

POSITIVE - ADJUSTABLE

Adjusts up to $\frac{1}{32}$ inch to bring the accuracy and gripping strength of the Erickson Chuck to equipment where alignment is required.

Model 102 Floating Holder.

ERICKSON *Precision* TAPPING CHUCKS

A positive drive tap chuck offering for the first time accuracy in tapping and threading of holes.

Erickson Tap Chuck on Warner & Swasey Precision Tapping and Threading Machine.

ERICKSON — The Chuck which grips on either flutes or shank of the drill.

Model U01 Tapping Chuck.

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No matter how tough the job, there's a

KRW HYDRAULIC PRESS

that can do it CHEAPER and BETTER

ustrated are a few of the many adaptations of the mous KRW Hydraulic Press which is doing a riety of pressing, forming, bending, straightening id closing operations for industry.

RW Presses are adaptable to literally hundreds special jobs. Using low-cost dies, manufacturing sts on many items are greatly reduced.
sing air pressure varying from 100 to 225 pounds, e resulting hydraulic pressure varies with the air ressure used. A built-in air regulator permits ex- t duplication of pressure on every stroke . . . this is important on many operations. KRW Hydraulic Arbor Presses are available for either vertical or horizontal operation or specially built to handle a particular operation.

We also manufacture suitable capacity air compressors. Write for fully-illustrated Hydraulic Arbor Bulletin.

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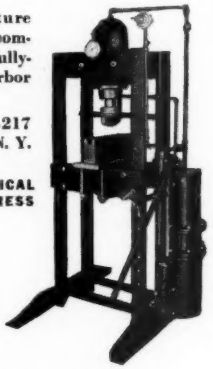
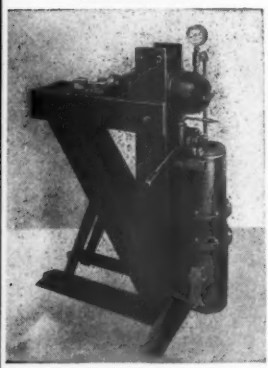
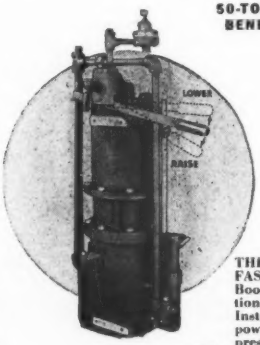


50-TON VERTICAL BENDING PRESS

SPECIAL FORMING AND BENDING





THE KRW SPEEDI-BOOSTER

THE REASON WHY KRW PRESSES ARE FAST AND ACCURATE. The KRW Speedi-Booster eliminates the need for the conventional type Capstan wheel or pumping lever. Instead, it uses compressed air as the motive power operating the ram. Because the compressed air is controllable through a pressure regulator, any desired tonnage pressure at the ram can be obtained and duplicated. Ram movement (up, down or stop) is instantly controlled with the slightest fingertip movement of the lever.

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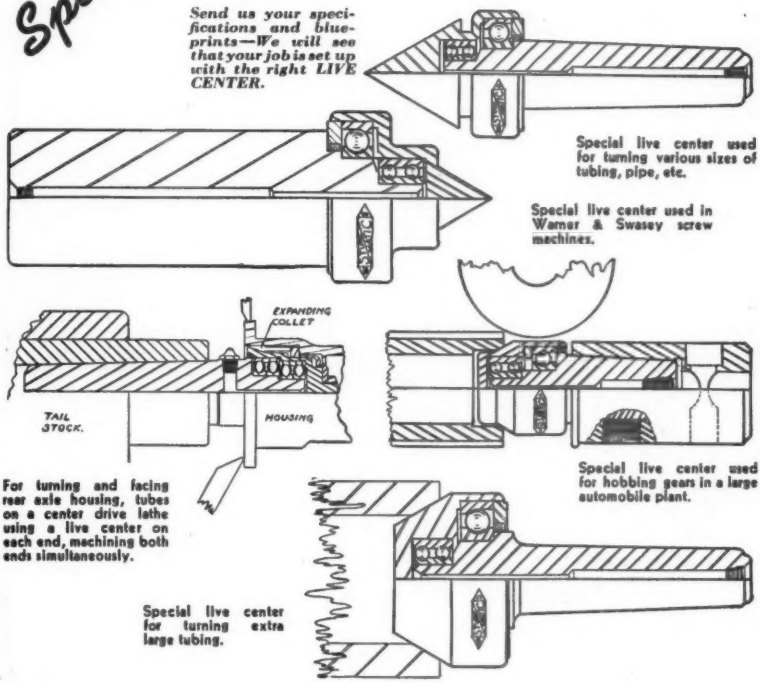
Send us your specifications and blueprints—We will see that your job is set up with the right LIVE CENTER.



Special live center used for turning various sizes of tubing, pipe, etc.

Special live center used in Warner & Swasey screw machines.

For turning and facing rear axle housing, tubes on a center drive lathe using a live center on each end, machining both ends simultaneously.

Special live center used for hobbing gears in a large automobile plant.

Special live center for turning extra large tubing.

Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . . that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock. Prompt deliveries on high priorities.

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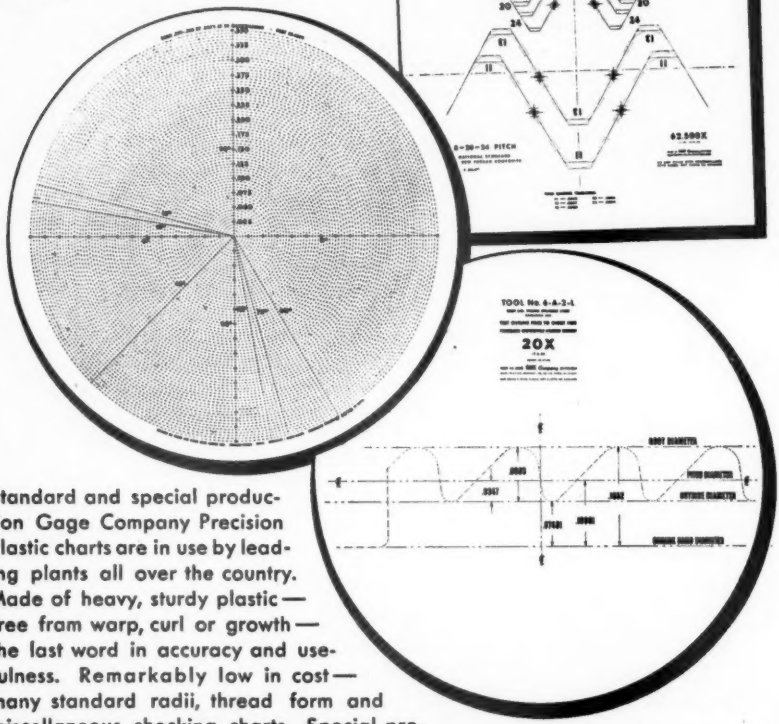
AND PROVIDED ADDED PERFORMANCE ON EVERY TYPE AND MAKE OF OPTICAL COMPARATOR



Standard and special production Gage Company Precision Plastic charts are in use by leading plants all over the country. Made of heavy, sturdy plastic — free from warp, curl or growth — the last word in accuracy and usefulness. Remarkably low in cost — many standard radii, thread form and miscellaneous checking charts. Special production charts constructed to order, afford maximum comparator use and reduce inspection costs.

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When parts must be held together for such operations as welding, drilling, fabricating, etc., Knu-Vise Toggle-Action Clamps speed production, for no time is wasted screwing down and then unfastening holding devices. One quick motion accomplishes either in an instant.

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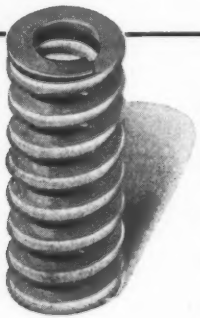
FASTER, FINER DIE WORK

By using the Die Spring Tailored for the Job



WARTIME die work demands greater speed and accuracy. You can meet this demand by using the die spring tailored to the job... and to the press. Customized die springs for each particular requirement are available at Muehlhausen; in series "S" for high speed, "M" for regular speed, and "HD" for heavy duty presses. Over 200 sizes are stocked, ranging from 1 to 15 inches in length, from ¾ to 4 inches in diameter, and from 80 to 3000 lbs. in load capacity.

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EVERY TYPE AND SIZE

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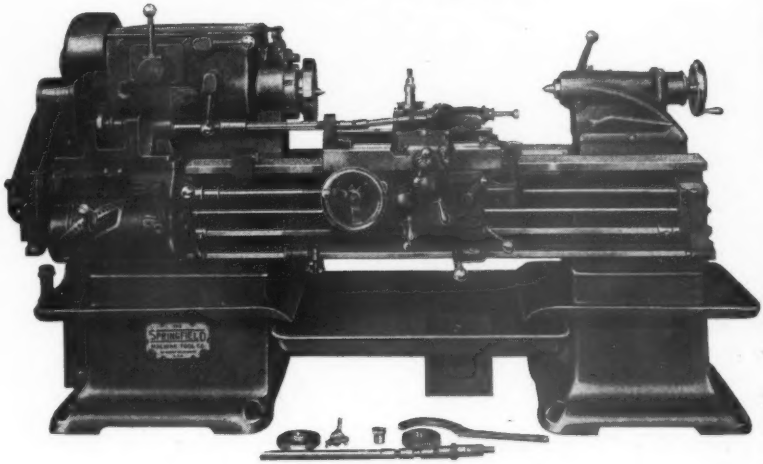
Out in front!



● Headstock . . . twelve speeds . . . only half of the easy-shifting spur gears mesh at one time.

Motors . . . V-Belt or silent chain drive.

Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

Taper attachment . . . hair-trigger adjustment.

Compound rest . . . sturdy, firm.

Tailstock . . . all bearings and bed ways oiled from one well.

From headstock to tailstock—the SPRINGFIELD Lathe is *out in front!*

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Tells the why and how of Springfield's accurate production.

THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO, U. S. A.

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For almost three-quarters of a century, The Chicago Screw Company has been making fine threaded products...The "Know How" accumulated over these long years of experience has resulted in a great line of "Safety Plus" Socket Screw Products including Socket Head Cap Screws, Socket Set Screws, Socket Pipe Plugs, Socket Stripper Bolts and Square Head Set Screws . . . On your future requirements, specify Chicago "Safety Plus" Socket Screws—they are definitely better.
These Fine Products are sold only thru Authorized Distributors
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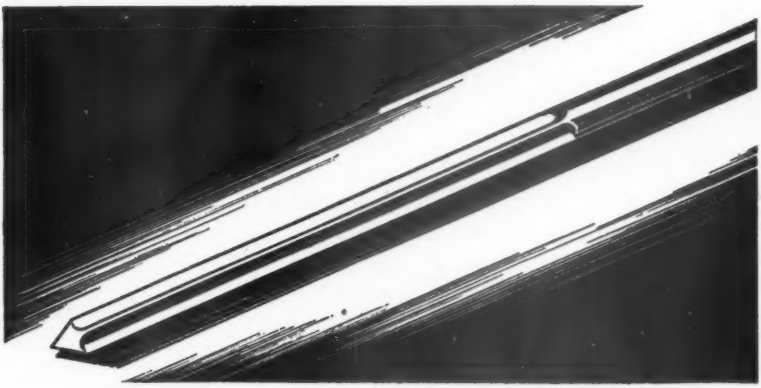

2000 HOLES PER REAMER —Instead of only seven!

Here is a war-production fact that sounds fantastic—yet its truth brings striking evidence of the superior performance of L & I Ground Flute Reamers, when they replace ordinary milled flute reamers.

The Oilgear Company of Milwaukee reports that with milled flute reamers they were usually unable to complete with one reamer the seven holes required in an important piece. They are now using L & I Ground Flute Reamers and are producing an average of nearly 2000 holes per reamer.

If you haven't tested the keener cutting edge and longer life of L & I Ground Flute Reamers against the ordinary milled flute reamers you are now using, why not send us a trial order—or write for literature?

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VERTICAL SPINDLE GRINDER

NEW Abrasive M34 Grinder packs five h.p. within its motorized spindle—ample power for every production need. Design minimizes vibration, eliminates gearing and belting and permits heavy cuts with a good finish. Engineered and built to Abrasive's high standards. Many new features.

Available for immediate delivery.

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ABRASIVE MACHINE TOOL COMPANY • EAST PROVIDENCE 14, RHODE ISLAND

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● Our large stock of die accessories of all kinds assures prompt shipment.

Dowel pins in 163 standard sizes (plus oversizes) ground to exact diameters, carburized, hardened and tempered to case hardness Rockwell C. 60-62 effective to depth .020" and core hardness Rockwell C. 50-54.

Standard and Special die sets in all sizes.

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DETROIT DIE SETS ★

Drill Jig Bushings!

Ex-Cell-O was a pioneer in the manufacture of drill jig bushings to close hole limits. Naturally, these closer limits make possible longer tool life and greater accuracy of work. Today Ex-Cell-O, noted as headquarters for precision-made bushings, carries one of the largest and most varied stocks of drill jig bushings available in the world. A.S.A. Standard bushings can be obtained directly from Ex-Cell-O's Detroit and New York offices and from the Machinery Sales Company in Los Angeles.

EX-CELL-O CORPORATION

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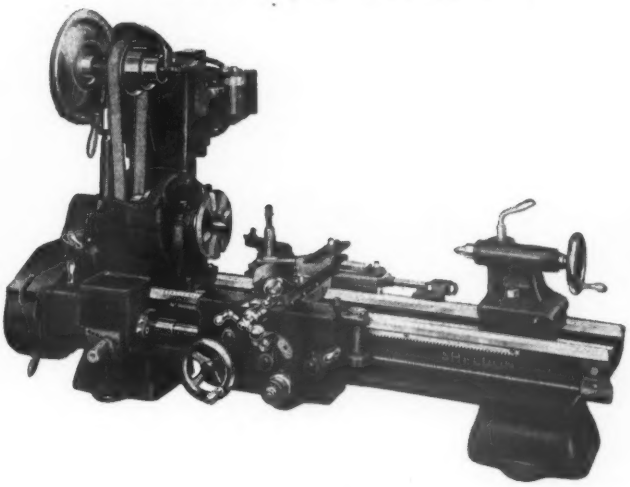
SHELDON

PRECISION LATHES



Among moderate priced lathes, the SHELDON 1026 BMWQ is not only superior in design, workmanship, features and precision, but in its convenient, space-saving and *more efficient* overhead motor drive. . . . .

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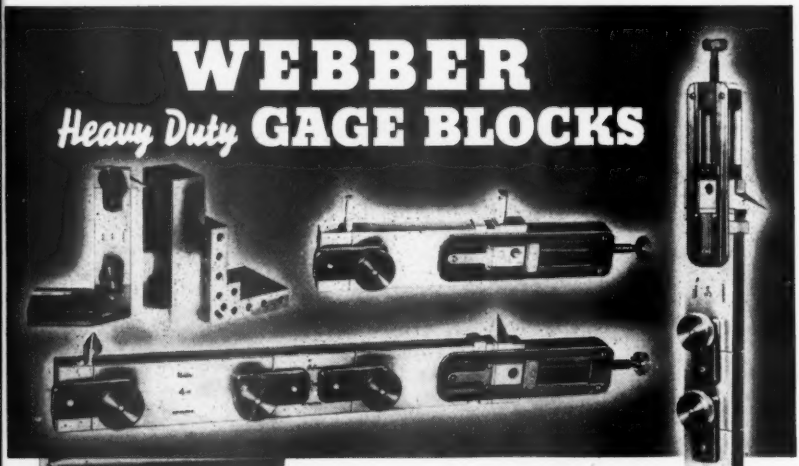
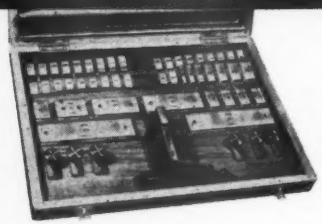
WEBBER
Heavy Duty GAGE BLOCKS





● A handy, complete set of blocks and clamps for making precision measurements up to 36 inches. Additional blocks and clamps available for increasing capacity.

With this set everything you need is in the set. There are no loose pins, screws or small parts which take time to assemble and are easily lost.

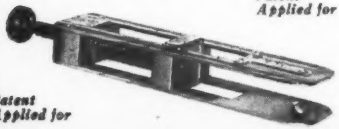
The Webber Eccentric Clamp and the Quick Acting Gage Clamp permit quick, easy assembly of blocks into a unit of precision measurement. There is positively no change in dimension due to clamping action.

Right — Webber Eccentric Clamp used to unite several blocks quickly into one solid, accurate gage.

★

Below—Webber Quick Acting Gage Clamp snaps onto the end of any of the long blocks and firmly holds any other blocks necessary to make up the fractions of an inch. Only one of these is required with each set.

Patent Applied for



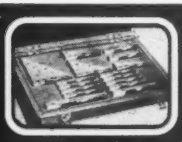
Patent Applied for

Webber offers two Heavy Duty Gage Sets—

No. 24 Range from .300″ to 24.000″ in steps of .0001″

No. 36 Range from .300″ to 36.000″ in steps of .0001″

Write today for bulletin illustrating and describing this compact, useful set of gages for precision measuring.

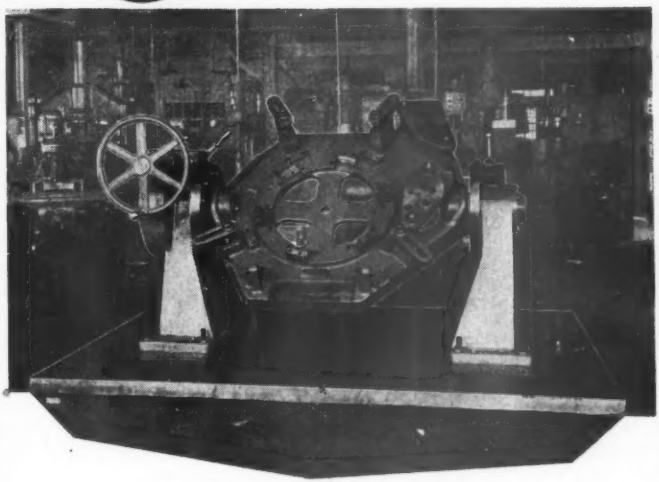


Webber GAGE COMPANY

12903 TRISKETT RD. • CLEVELAND 11, OHIO

POTTS
MACHINE COMPANY

• *Our catalogue will be mailed to you on request*



4 Position Indexing Fixture for Drilling and Reaming numerous holes of various dimensions to close tolerances.

Jigs & Fixtures like these can only be built by Master Craftsmen working with Precision equipment.

We solicit your inquiries

POTTS MACHINE CO., 2501 E. Michigan Ave., JACKSON, MICHIGAN

Builders of Tools, Dies, Jigs and Fixtures

How TURCHAN CONVERTS A HAND-JOB INTO A MACHINE-JOB . . . . !

SEND US
Sample or Blueprint of Parts —for Turchan Production Estimate

Formerly the production of propeller blades was strictly a hand-job. Then along came the Turchan and converted it into a simple machine-job of profiling with a planer—performing the operation in 1/20th of the time.

Using a model as a guide, the Turchan Attachment is shown above planing the irregular contour on a forged member of a 2-piece brazed propeller blade, planing it to close tolerances. On other similar operations, such as planing turbine blades, impellers, and large cams of irregular shapes, tolerances are also held very close.

"Turn to Turchan"

If your production problem is one of finishing parts of irregular or eccentric shape on milling machines, lathes, grinders, planers, shapers or boring mills, send us the part or a blueprint and we'll tell you how the Turchan Attachment can be used to your definite advantage.

TURCHAN FOLLOWER MACHINE CO.
8257 Livernois - Detroit 4, Mich.

TURCHAN
Hydraulic Follower Machine

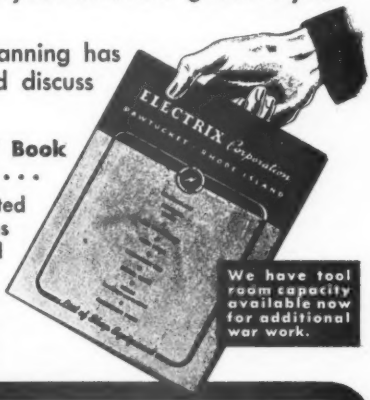
WE ARE NOW ACCEPTING ORDERS
FOR MACHINE SHOP WORK ON POST-WAR LINES

X-Day plus One! Are you going to start then to figure what tools and parts you're going to need for civilian productions? Or, can you order now what you know you're going to need? We can begin to manufacture for you the minute materials are released, and you'll be weeks, maybe months along toward your reconversion goal.

However far your post-war planning has progressed, send us prints and discuss your requirements NOW!

Our New "List of Equipment" Book Will Tell You What We Can Do . . .

All of our machine-shop equipment listed for quick reference, and illustrations of many of our precision tools and parts.



We have tool room capacity available now for additional war work.

This book is FREE to interested executives. Write for yours—today!

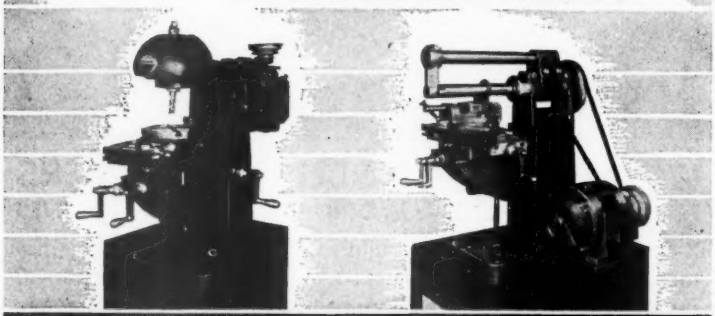
GO PRECISION AUTHENTICATORS NO-GO

JIGS and FIXTURES • FORM TOOLS • SPECIAL TOOLS • LAMINATION DIES • SMALL PARTS and ASSEMBLIES • SPECIAL GAGES • MOLDS

ELECTRIX *Corporation*

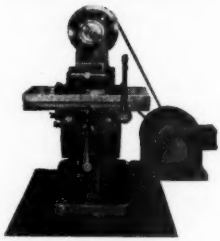
156 MIDDLE STREET • PAWTUCKET, R. I.

ONE BENCH MACHINE FOR *BOTH* HORIZONTAL and VERTICAL MILLING



Vertical Mill *Horizontal Mill and Overarm*

FOR PRECISION TOOL WORK OR HIGH-SPEED PRODUCTION



Production Mill with Rack and Pinion Feed

benchmaster—offers a bench milling machine easily convertible from a conventional horizontal to a vertical miller by simply interchanging the spindle attachments.

ACCURATE • VERSATILE • LOW PRICED

SPECIFICATIONS: Table size—6" x 14"—Three Tee slots ⅜", 2" center • Longitudinal travel 8½" • Traverse travel 5½" • Vertical travel 8½" on vertical mill—9½" horizontal mill • Height 28" • Weight (less motor) 215 lbs. • Requires 1/3 h. p. motor • Spindle speeds (standard 1725 rpm motor) 450-850-1400-2100 rpm.

benchmaster tools — manufacturing company

2952 w. pico, los angeles 6, cal.

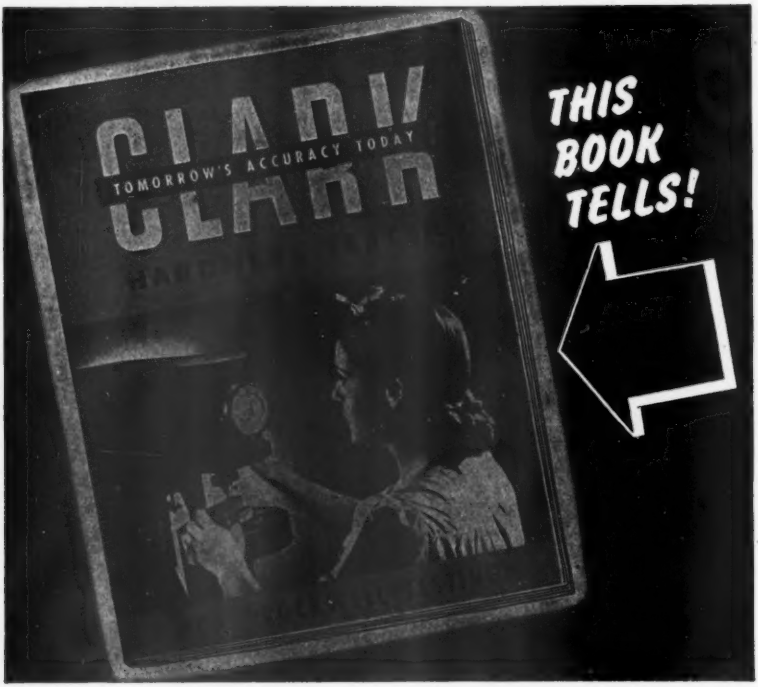
Machine Tool-
GEARSHIFT DRIVES
by
LIMA

WATCH OUR AD.
for future
Important Announcements!

THE LIMA ELECTRIC MOTOR CO.
899 Findlay Road
LIMA, OHIO
REPRESENTATION IN MOST PRINCIPAL CITIES
LIMA GEARSHIFT DRIVES - LIMA ELECTRIC MOTORS
LIMA MAGNETIC POLISHING LATHES - LIMA PEDESTAL GRINDERS

DO YOU KNOW THE TRUTH

About Hardness Testing?



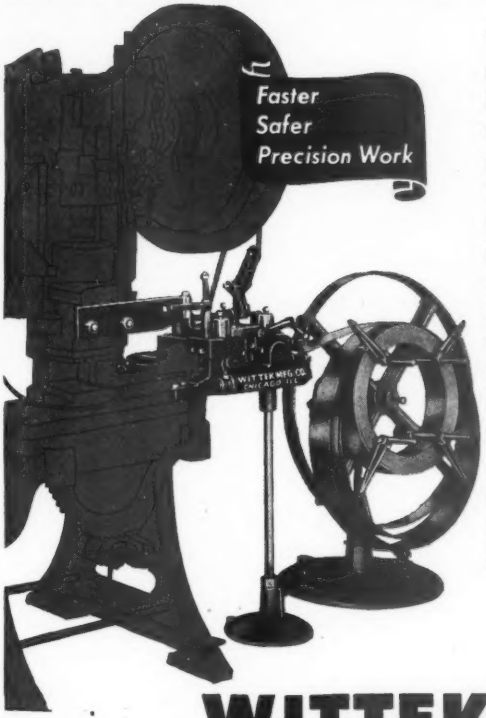
CLARK
TOMORROW'S ACCURACY TODAY
HARDNESS TESTER

The new Clark catalog is more than a catalog.

It is a 20-page reference manual on the history, theory, practice, and equipment for modern, scientific hardness testing. Printed in two colors, 8½″ x 11″, it is available without charge to manufacturing executives. Just drop a line on your letterhead to Department TD, CLARK INSTRUMENT INC., 10200 Ford Road, Dearborn, Mich.

Planning Peacetime Production Using Coiled Strip Stock?

Equip with
WITTEK
Automatic Roll Feeds and Reel Stands



Wittek Roll Feeds are being used extensively by war plants in their large volume production of high quality metal stampings. The flexibility of Wittek Roll Feeds will assist these plants in their peacetime conversion through their adaptability to various jobs. Keen competition will demand the utilization of equipment to its point of highest efficiency. If your postwar plans include punch press production of parts from coiled strip stock—investigate now the many possibilities of Wittek Roll Feeds and Reel Stands.

Write for catalog, prices and recommendations

WITTEK
MANUFACTURING CO.
4305-15 W. 24th Place, Chicago 23, Ill.

Automatic
ROLL FEEDS
AND
REEL STANDS
WMCo

Sharp, Clear Impressions
ON ALL METAL MARKING JOBS!

ANY METAL PART that requires a serial number, a catalog number, size identification—or any other type of marking—can be quickly and *clearly* marked with Mercury Steel Letters and Figures!

These Stamps are made of the finest carbon steel to protect against breakage and give you years of service on all part marking work. The letters or figures are deep cut with sharp faces for ease of stamping on even the hardest metals. Accurate bevel further assures clear impressions, and aids in alignment. The husky steel body is amply large to withstand severest use.

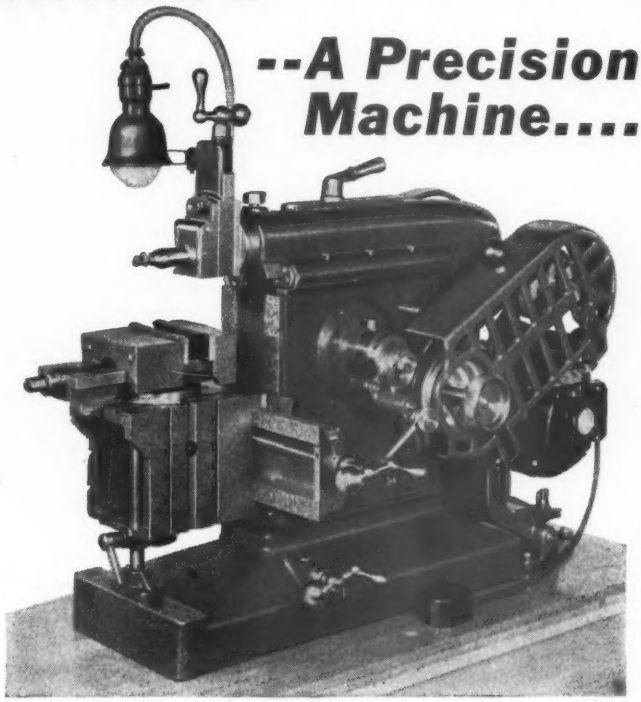
A large stock of Mercury Steel Letters and Figures in sets and sorts is available in sizes to meet a complete range of metal marking needs. Special sizes can be made to your specifications, if desired. *Write Dept. D for complete details, and briefly outline your marking problem for our recommendation on the Mercury Stamps to meet your needs!*

Metal Marking Tool Specialists for Over 25 Years

MERCURY METAL DIE AND LETTER CO.
546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA

AMMCO 7" SHAPER

--A Precision Machine....



On jobs requiring a stroke of 7" or less, the AMMCO 7" SHAPER will enable you to save a lot of time and expense on a set-up such as would be required on larger shapers . . . You also have an opportunity to effect considerable savings in capital investment . . . savings in electrical power consumption . . . and savings in floor space . . . Furthermore, in addition to getting away from the larger cost of operating a big shaper on small work, the AMMCO will leave big shapers open for big jobs . . . Users tell us "it's the finest made."

Available for stationary installation, or as a portable unit.

ARMY E NAVY

Write today for specifications and prices.

AMMCO 2100 COMMONWEALTH AVENUE
NORTH CHICAGO, ILLINOIS

Heat Treat Your Own Small Parts...

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.

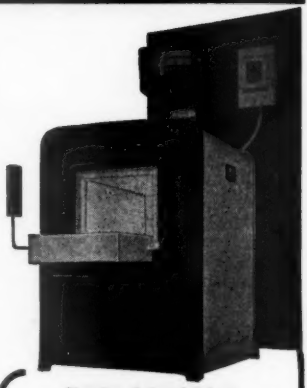
AVAILABLE IN TWO SIZES

Type	*Chamber Capacity*	*Amps 115 V*	*Watts*	*Amps 230 V*	*Price*
MH-3	8"W 6"H 14"L	29.6	3400	14.8	$124.00*
MH-4	10"W 6"H 18"L	....	4800	20.9	$191.00*

**Includes Hearth Plate*

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.



REPLACEABLE HEATING ELEMENTS

Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel—furnace structure remains undisturbed.

FREE—Complete data covering specifications, additional applications and ordering instructions are included in this new folder.. Write for your copy today. Ask for Bulletin No. 50.

COOLEY ELECTRIC MANUFACTURING CORP.
32 SOUTH SHELBY STREET • INDIANAPOLIS 7, IND.

INDUSTRY'S NEW TOOL OF MULTIPLE USES

A Four-ton giant in midget form!

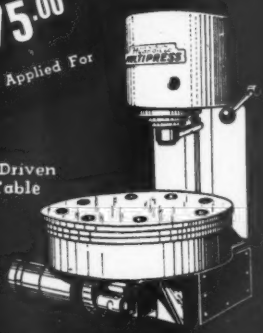
MULTIPRESS

MULTIPRESS is a *new kind* of machine tool! Compact, streamlined, completely self-contained, this bench-size oil-hydraulic "work horse" packs up to 4 tons of accurately controlled power, and adapts that power to an amazingly wide range of operations. Standard fixtures and accessories extend its applications to almost every type of work calling for *pressure*—sustained or in repeat strokes . . . in single or automatically repeated cycles . . . synchronized with indexing tables or other feed mechanisms. The basic unit alone, without any of its many accessories, delivers downward ram pressures of from 300 to 8000 pounds . . . upward pressures to 5000 pounds . . . strokes of from 1/16 inch to 6 inches . . . ram speeds up to 200 inches per minute downward, or 300 upward. Work table measures 10 1/2 x 16 inches. Opening between ram and work table is 11 inches. Write today for complete details on MULTIPRESS, the NEW tool of Industry's Right Hand.

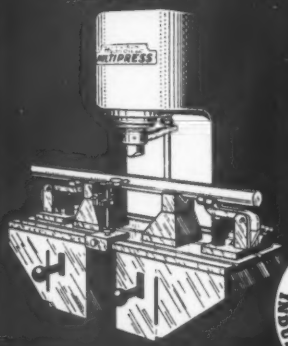
Basic Unit

$575.00

Patents Applied For



With Motor Driven Indexing Table



With Straightening Fixtures

The DENISON Engineering Co.

1197 DUBLIN ROAD, COLUMBUS 16, OHIO

INDUSTRY'S RIGHT HAND

DENISON EQUIPMENT in APPLIED HydrOILics

HydrOILics INDUSTRY'S RIGHT

THE CINCINNATI SHAPER CO.

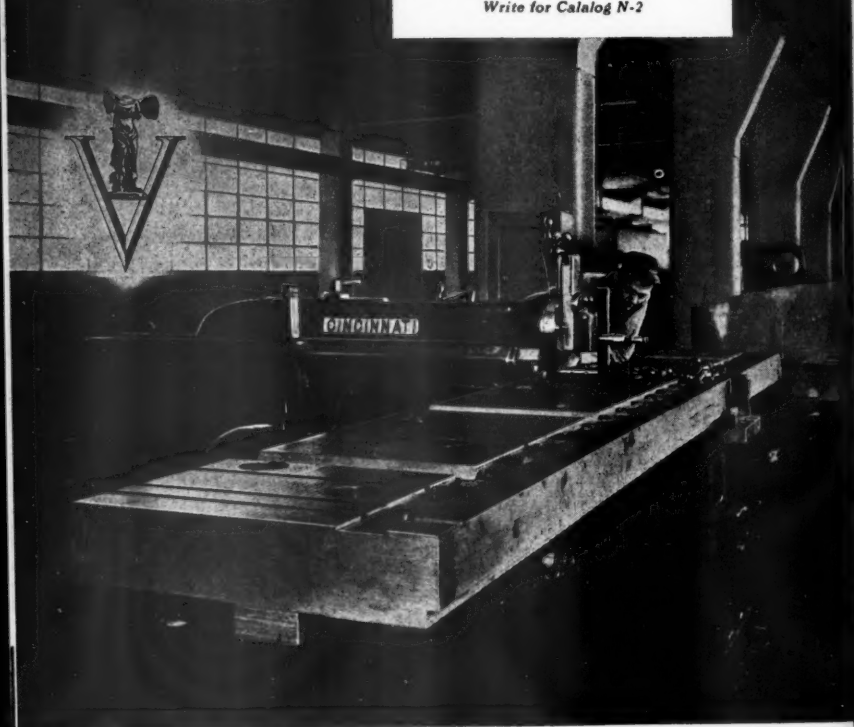
CINCINNATI OHIO U.S.A.

SHAPERS BRAKES SHEARS

Shaping a 10,000 lb. Plate

The Shaper is recognized as indispensable in the toolroom—but many manufacturing jobs are best performed on Shapers. Whether shaping slots in a 10,000-lb. plate or contouring small parts, the power and accuracy of Cincinnati Shapers will meet your requirements.

Write for Calalog N-2

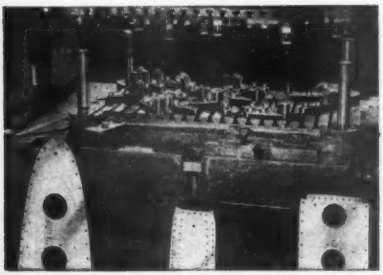


YOU COULDN'T ASK FOR ANYTHING MORE SIMPLE — OR BETTER THAN

WHISTLER ADJUSTABLE PUNCH and DIE UNITS

Whistler Adjustable Dies work on any type press and because of their simplicity even new workers quickly learn to make pattern change-overs—increasing productive press hours. Absolute precision on short or long runs. Whistler design permits more perforations in a given area—often reducing press operations.

For quick and complete information on the advantages of Whistler Adjustable perforating and notching dies send a description or drawing of your work.



These pieces produced with Whistler Adjustable Dies clearly illustrate the re-use of same punch and die units.

These photographs show the simplicity of a Whistler Adjustable Punch and Die assembly. Every piece is interchangeable.

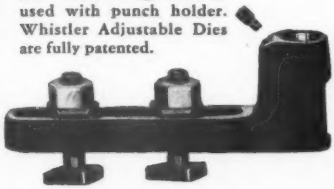
Self-locking bolts on punch holder drop into T slots of die shoe. Set-screw engages into recess at base of punch. Punch cannot turn or pull out in operation.

Punches of finest tool steel are machined to .0001" tolerances.

Stripper unit fits smoothly over punch—no "wobble". Flushed set-screw engages into groove on punch body. Stripper or punch quickly removed when desired.

Grooved heads on dies make lifting from holder quick and easy. Like the punches, dies are held firmly into holder by set-screw in recess at base. Whistler *precision* is known the world over.

Die holder has self-cleaning slug chute. Special design bolt heads present two bearing surfaces to T slot channel—self-locking, same as used with punch holder. Whistler Adjustable Dies are fully patented.



Write for the Whistler Catalog—every Production Executive should have it.

S. B. WHISTLER & SONS, Inc.

Over 25 Years of Tool and Die Making Experience

752-756 MILITARY ROAD BUFFALO, N. Y.

The Sunnen Precision Honing Machine – with New Coolant Pump and Base –

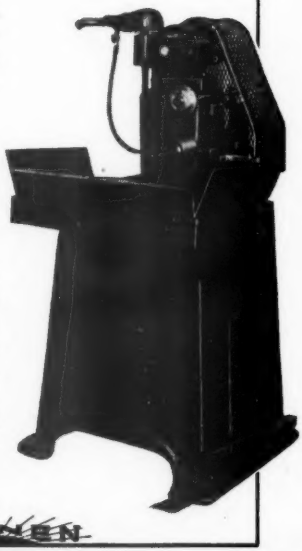
Provides GREATER HONING SPEED and ACCURACY

With the addition of a new base that contains a pump for supplying honing fluid, the Sunnen Precision Honing Machine is setting new standards of accuracy. Honing is faster, too. The honing fluid carries away all cuttings, keeps the abrasive stone sharp, and cools the part being honed.

With the Sunnen Precision Honing Machine, accuracy is guaranteed to be within .0001"— and has been held to .000025". A super-smooth finish can be produced. On certain types of metal, a finish of 2 to 3 micro inches can be obtained.

- **Hones and finishes cylinders from .185" to 2.625" in diameter**
- **Can be used in either ferrous or non-ferrous metals — plastics — ceramics, etc.**
- **Does not require skilled labor**
- **No jigs or fixtures needed**
- **Economical to operate**
- **Can be set up to operate in one minute**

Write for a free bulletin giving details about this low-cost honing machine — or ask a Sunnen engineer to show you how it can be used on your jobs.



The coveted Army-Navy "E" waves over the Sunnen plant — evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN

Typical Jobs

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.

Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter — held to .0002", stock removal .001", sixty per hour.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.

Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

SUNNEN PRODUCTS COMPANY, 7947 Manchester Avenue, St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

PRECISION CENTERED EYE BENDING

with

DI-ACRO BENDERS

A Centered EYE in 1 Operation

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at a high rate of production. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

BENDER No. 1

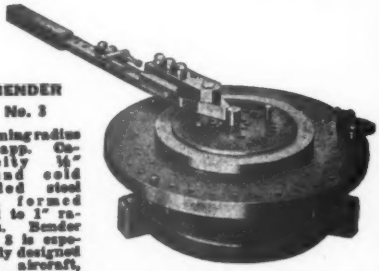
Forming radius 3" app. Capacity 7/32" round cold rolled steel bar or equivalent. All DI-ACRO Benders have two-way action, right or left hand mounting and reversible forming nose.

BENDER No. 2

Forming radius 6" app. Capacity ¼" round cold rolled steel bar, formed cold to 1" radius. DI-ACRO Benders form bus bar and other strip stock both flat and edgewise.

BENDER No. 3

Forming radius 9" app. Capacity ¼" round cold rolled steel bar, formed cold to 1" radius. Bender No. 3 is especially designed for aircraft, marine and other large radius bending.

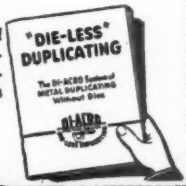


DI-ACRO precision bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

Send for Catalog

"DIE-LESS DUPLICATING"

showing many kinds of "DIE-LESS DUPLICATING" produced with DI-ACRO Benders, Brakes and Shears.



DI-ACRO IS PRONOUNCED "DIE-ACK-RO"

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

315 8th Ave. S.
Minneapolis 15, Minn.

Meeting 9 Out of 10 Needs...

with 24 DIFFERENT TYPES...3 SIZES EACH!

SIEWEK

Fixture Clamps and Fittings

Also... JACKS · JACK LOCKS · FIXTURE LOCKS · REST BUTTONS · RESTS AND CAMS · HAND KNOBS

Also Makers of
SIEWEK
Rapid Clamping Drill Jigs
and
SHEAR-CUT **End Mills**

The needs of most jobs are met by the wide variety of types and sizes of Siewek Clamp Assemblies. Designed to reduce the time required to meet job conditions by 50% to 75%, these clamps need a minimum of details. *In fact, you can buy the complete clamp assembly for less than the cost of designing it on your drawing board!*

Siewek Clamps are strongly constructed to provide uniform right angle pressure for secure holding. All parts subject to strain are specially heat treated and hardened, to last for years with maximum safety.

Write today for full size template drawings to use in in laying out work.

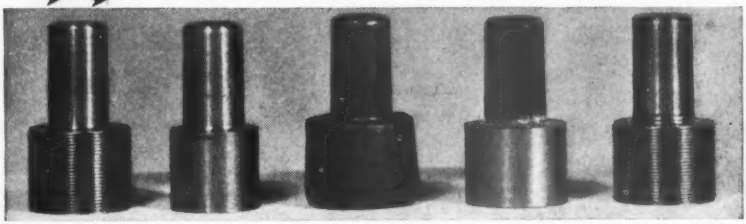
SIEWEK TOOL DIVISION
OF DOMESTIC INDUSTRIES, INC.
Detroit (Ferndale Station) Mich. • ***Distributors in Principal Cities***

GRIFFIN PROCESS
welds
20 TIMES MORE WEAR RESISTANCE
onto new or old thread gages!

GRIFFIN PROCESS welds a solid, tough, wear-resistant layer of fine-grained chromium carbide alloy to the surface of your worn gages after old threads are removed. Threads are then re-ground to size in the solid carbide, salvaging the old gage and producing a new gage *with an average of 20 times more life!* Equal results are obtained using the Griffin Process for manufacturing new gages.

SIZES: GRIFFIN PROCESS can now be applied to all thread plug gages from ⅜" up, and on thread ring gages from 1" up.

HERE IS THE GRIFFIN PROCESS...



Your worn gage as it comes to us.

Your worn gage with threads removed.

Your worn gage with chrome carbide alloy welded on.

Your worn gage ready for thread grinding.

Threads ground and diamond-lapped to exact dimension.

GRIFFIN PROCESS is ECONOMICAL

RECORDS show a minimum of 15 times more service at an approximate cost of only three ordinary tool steel gages. Griffin Processed gages have been reported to deliver up to 60 times more life than tool steel gages. Actual life increase varies, depending upon material being gaged.

Guaranteed workmanship—prompt deliveries—send your old gages for quotation. Folder mailed on request.

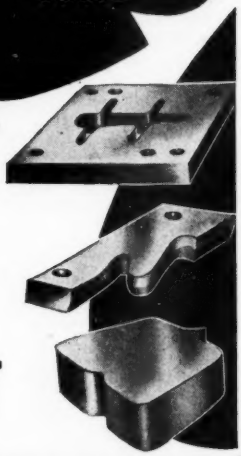
GEORGE O. GRIFFIN COMPANY
1301 WEST HADLEY STREET • WHITTIER, CALIFORNIA

Chrome Carbide Thread Gages

BOYAR-SCHULTZ
No. 1 PROFILE GRINDER

New Improved Design . . .

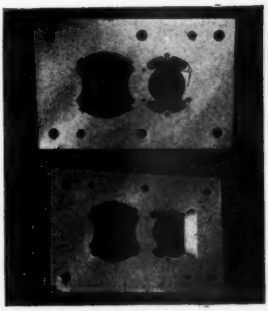
New Improved Table



You Can Do It BETTER . . . FASTER With Boyar-Schultz No. 1 Profile Grinder

1. In Tool and Die Work. Replaces slow hand work in fitting dies and punches.
2. Speeds grinding and finishing profiles and contours in Production.
3. High spindle speed assures efficient grinding even with ⅛" diameter wheels.
4. New Design — Streamlined for appearance and rugged durability.
5. New Square Table has serrated top which frees surface of grindings, and permits smoother movement of work and closer tolerances.
6. Light in weight and portable.

Write for New Circular giving Full Description



For Die Repairs Also—*Upper photo shows a die broken in service. Lower photo shows how die was prepared for insert with No. 1 Profile Grinder.*

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2112 WALNUT STREET • • • CHICAGO 12, ILL.

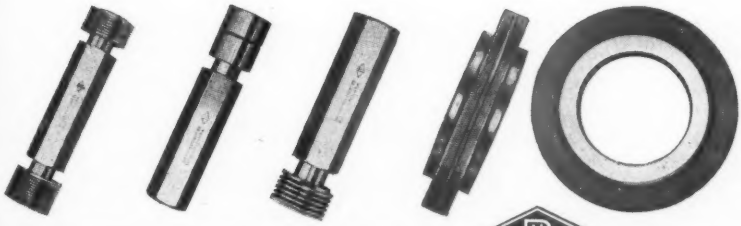
To speed up Production

In these days of peak production, just wire Department EX when you need gages in a hurry. We keep the most popular sizes of standard Plug, Ring and Thread Gages in stock—ready for prompt shipment in emergencies.

Precision Gages

Both stocked items and special gages carrying the PM trademark are made to top standards of precision, carefully finished and hardened, to retain their accuracy under severe use. Monthly stock list will be sent on request.

Wire Department Ex



ARMY E NAVY The PIPE MACHINERY COMPANY Cleveland, O.

SOMETHING NEW HAS BEEN ADDED TO OUR LINE OF

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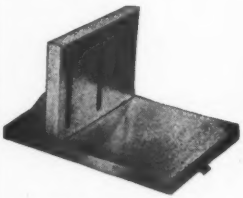
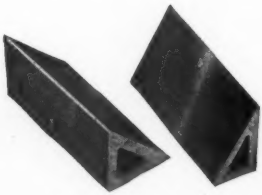
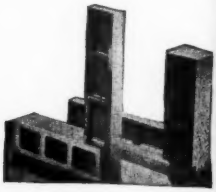


Masterangle Plates



Angle Attachments



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is now in the ROTARY FILE field—"with both feet"

(Hand Cut and Ground Types)

NICHOLSON has the mill-supply distributing facilities to assure a near-at-hand source of Rotary Files in the types and sizes you may need.

NICHOLSON has the engineering service to aid in the proper use of Rotary Files; and to help in the selection of *The right file for the job.*

NICHOLSON Rotary Files are as sweepingly guaranteed for quality as the Nicholson hand files famed throughout the world for their slogan — *Twelve perfect files in every dozen.*

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showing both *Hand Cut* and *Ground* types. Each type is available in 16 standard styles or shapes; in 3 cuts (Coarse, Medium and Fine); in 64 sizes and in diameters ⅛" to 2".

ORDER THROUGH YOUR MILL-SUPPLY HOUSE

HAND CUT

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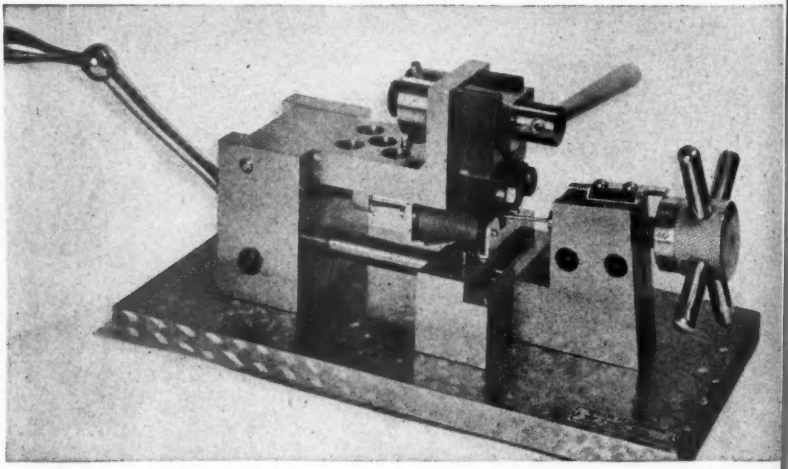
Your product is tested and proves itself in use. To insure this performance your product is first checked in your own shop to meet close tolerances.

Specially-designed gages, such as the one pictured below, made to whatever standards of measurement or shape you may specify, can simplify your gaging problems. Our long experience in making special devices to gage-makers' tolerances equips us with the quality of workmanship and the "know-how" to meet your specifications.

Let us discuss with you the particular application for which you may require a special gage.



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OF DIES • JIGS • FIXTURES • GAGES • SPECIAL MACHINERY • JIG BORING • PLANER EQUIPMENT

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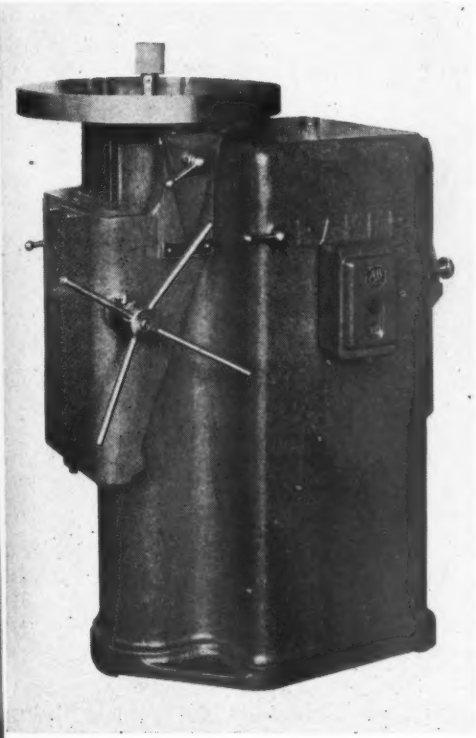
MODEL 3 CONTOUR GRINDER



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GRINDING

This simple design grinder is a highly practical cost-saving machine for hand grinding of a class of work for which other types of grinders are not adapted. Especially adapted for use in tool and die shops and tool rooms.

Capacity, diameter of wheels —½" to 4". Capacity, face of wheels—2", 2½", 3". Diameter of table—18". Vertical reciprocating movement of spindle—$\frac{3}{16}$". Reciprocating action provides better grinding action from the wheels—prevents shoulders from forming on the wheel—gives longer life to grinding wheels. Quickly-mounted diamond dresser is standard equipment.

BAKER BROS.

TOLEDO 10, OHIO

For complete details send for our folder.

NOW! MAKE YOUR OWN JIGS AND FIXTURES

with the ready-to-use Pre-Fabricated

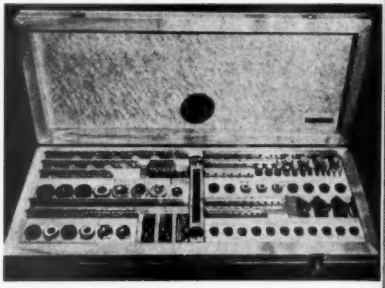
BORLOCATOR

in your own plant quickly, easily

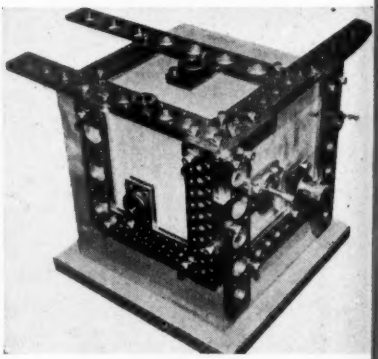
The ready-to-use, standardized parts of the MICRO-KING BORLOCATOR are easily assembled into jigs and fixtures of many designs. They save many man-hours of your most highly skilled labor by eliminating the necessity for making expensive drill jig plates. They reduce set-up time to a minimum. They effect great cost reductions because the BORLOCATOR is used time after time to cover a wide range of applications.

The MICRO-KING BORLOCATOR is known as the tooling development of a thousand uses. Here are a few of the many important ways it is now serving some of the largest mass-production plants:

1. Spotting old locations quickly
2. Drilling and reaming holes accurately
3. Accurate method for transferring holes
4. A precision layout fixture
5. As a master plate set up for coordinating drill jigs
6. For making temporary jigs until production jigs are made up
7. For drilling sample stampings
8. As a perforating fixture for metal and plastics material
9. As internal and external inspection gage for locating pin centers and bore locations



MICRO-KING BORLOCATORS are made up in three sets: Model A, angular and flat surface layouts; Model B, circular layouts in hexagon, octagon, and polygon spacing; Model C, box jig attachments.



With every purchase of both Model A and B sets of BORLOCATORS we will include without additional charge the Model C set of box jig attachments to be used with the Model A set for assembling a box jig layout as shown.

Mail us prints or sketches for your requirements. Your inquiry will receive prompt attention.

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SUN DIAL INDICATOR GAUGES

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DEPTH, LENGTH,
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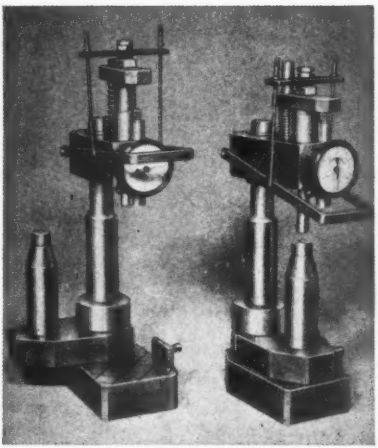
Measurements

DEPTH GAGE

HIGH-SPEED • • ACCURATE • FOOL-PROOF • • DURABLE •



THICKNESS GAGE

This high-speed, durable, and accurate gage enables you to take readings of variations as small as .0001". Each individual depth and length dimension can be checked visually, and errors determined. No expensive or complicated measuring equipment is required either for checking or setting. A simple master setting gage supplied with each SUN DIAL INDICATOR GAGE provides a quick and dependable method of setting and checking.

These instruments are being used in inspection rooms and on production lines by ordnance manufacturers working for the U. S. Army, Navy and Air Force.

Descriptive folder will be sent you on request—no obligation.

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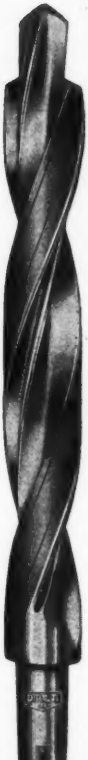
Goes Faster
WITH
OIL-HOLE DRILLS



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OIL AT THE CUTTING EDGE

This dual diameter drill permits TWO drilling steps in a SINGLE operation.

Please notice these illustrations which show very clearly our DOUBLE subland or DUAL diameter drills.

This type of drill is furnished in sizes from $\frac{3}{8}$" to $3\frac{1}{2}$" in diameter and up to 36" overall, with either straight or taper shank.

If you are having trouble in drilling
HERE IS THE ANSWER

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Manufacturers of

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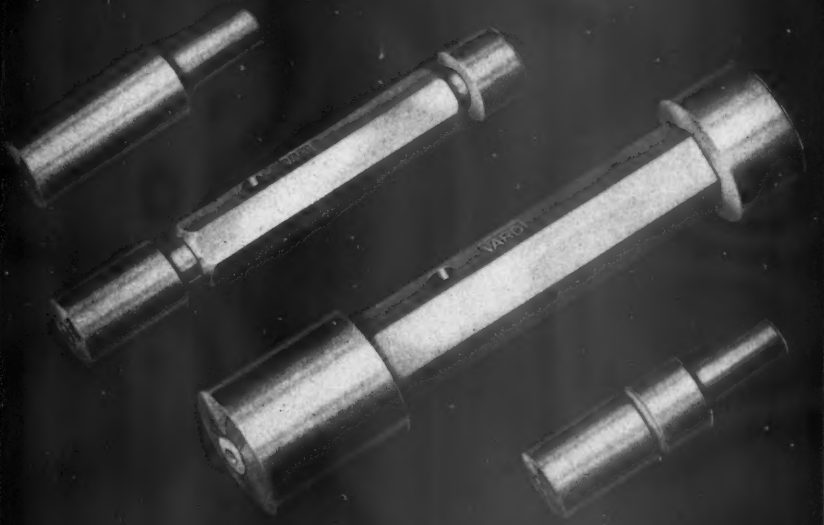
ACCURATE CYLINDRICAL PLUG GAGES



★ VARD cylindrical plug gages are made in complete range of sizes from .050 to 10-in. diameter; ground from Timken Graph-Mo steel, plain or hard chrome plated, or Norbide on order. Four types of gages illustrated here. *Top to bottom* — extra-long taper-lock member, taper-lock handle with GO and NO GO members, tri-lock handle with similar members and a progressive taper-lock member ★ VARD gages are accurate; give long service.

ARMY (E) NAVY

Right: VARD recommends that GO member cylindrical plug gages in Class XX, X, and Y be ordered with the special pilot. This patented feature speeds alignment... more than triples the inspection output.

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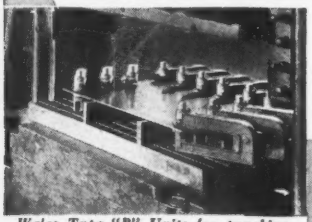
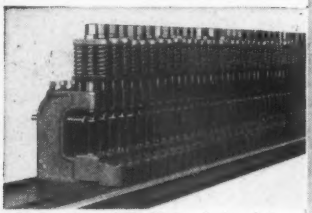
Why it's CHEAPER QUICKER EASIER *to use*

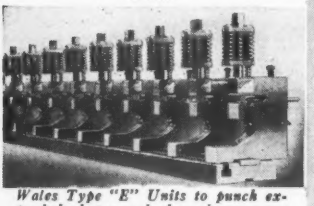
WALES HOLE PUNCHING UNITS



Wales Type "B" Units for punching sheet material in stamping presses

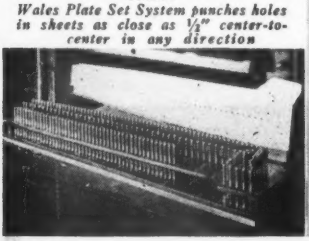


Wales Type "C" Units designed for punching angles and sheets on press brakes



Wales Type "E" Units to punch extruded shapes and channels on press brakes

Wales Plate Set System punches holes in sheets as close as ¼" center-to-center in any direction



Wales Hole Punching Equipment has revolutionized hole punching practices by making available to the metal working industry such time-saving, money-saving features as:

- **Unusual time-consuming adjustments of conventional set-ups are eliminated.**
- **Punch and die held in perfect alignment by holder.**
- **Each unit is independent and self-contained.**
- **Straight line, staggered or scattered patterns, punched with same units.**
- **Same group of units may be used interchangeably on press brakes and stamping presses.**
- **Nothing attached to press ram.**
- **Individual units may be instantly removed or reset.**
- **Punches may be interchanged without disturbing set-up.**
- **Die-setting and press "down-time" reduced to minutes.**
- **Same units may be used and reused in unlimited patterns.**

By combining these *exclusive and patented features* into Wales Hole Punching Units, die making time is reduced to a quick assembly operation.

In keeping with the progressive Wales-Strippit policy, "There's Always Something New in the Wales Line," new hole punching equipment is continually being introduced to the metal working industry.

To punch it quicker, at less cost, *write for Catalog* TODAY.

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355 Payne Avenue
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(Between Buffalo and Niagara Falls)
George F. Wales, President

Specialists in Punching and Notching Equipment

A Self-Contained Pneumatic Forging Hammer

The Chambersburg Pneumatic Forging Hammer has a greater forging output than any other hammer of its type. Added to the advantage of more powerful blows is that of greater rapidity of blows, which permits working the forging at higher temperatures.

The hammer is of the self-contained type, having a compressor piston cylinder and ram cylinder in which a compressor piston and a ram operate. In operation the ram is driven up and down by a flexible air force, created by the compressor piston. The compressor piston is driven by an electric motor of high speed through two stage speed reduction gearing.

The hammer can be started instantly and strikes a constant number of blows heavy or light at the will of the operator. As soon as the motor is up to speed the hammer is ready to operate.

Made in 3 types:

1. One Piece (as above), 200 lbs. and 300 lbs.
2. Solid Frame, 300 lbs. and 500 lbs.
3. Two Piece Frame, 750 lbs. and upward.

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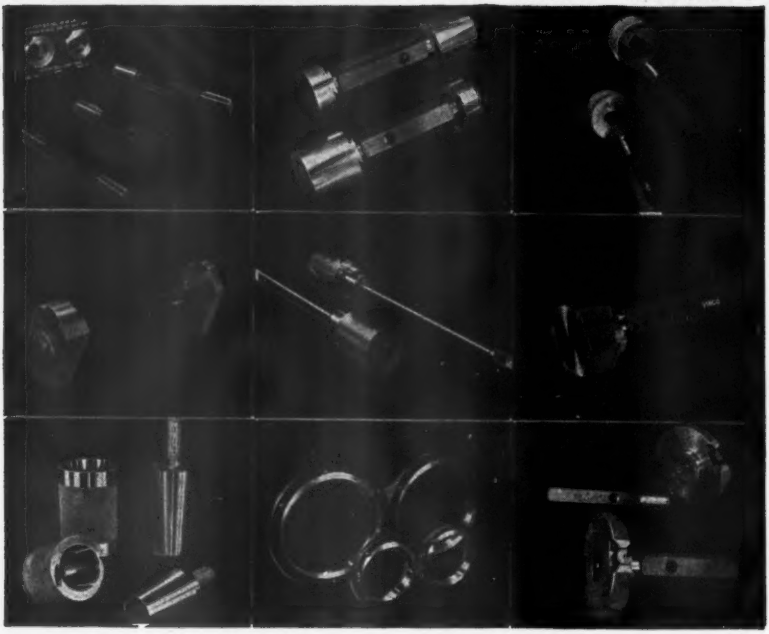

Simplicity of design plus a great demand have encouraged many gage shops to bid for this type of gage work without having sufficient skill and knowledge to produce the perfection required for constant, accurate gaging. A plain cylindrical gage must not only be accurate but have a hard, durable surface, smooth enough to satisfy the microscopic scrutiny of the surface analyzer. To grind the plug blank down to the required size and still maintain enough lap stock so the minute grind ridges can be lapped to this required smoothness involves a technique that is not learned over-night, a "know-how" that is developed only after long experience. That is the way *WE* make them—so if you are in the market for a plain cylindrical plug that is both durable and accurate, the best suggestion we can make is—Buy VINCO.

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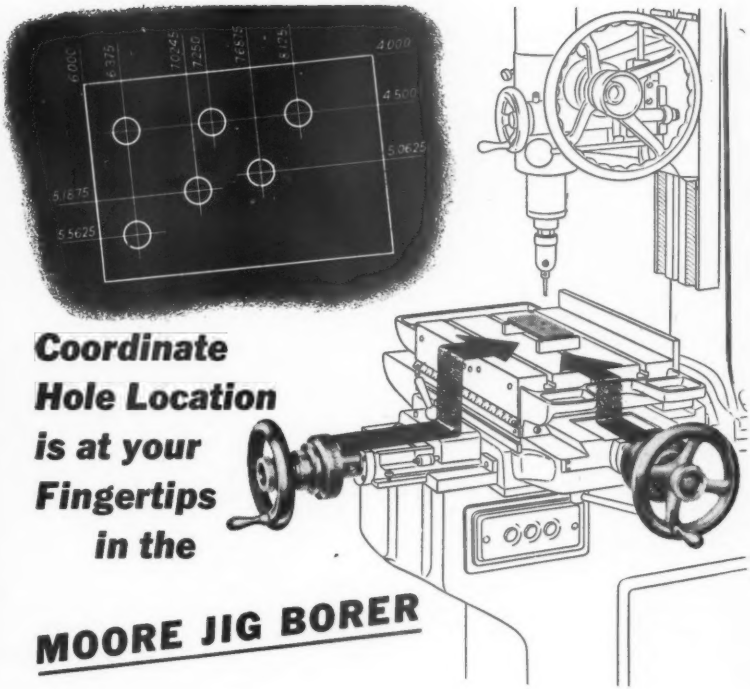

Coordinate Hole Location is at your Fingertips in the MOORE JIG BORER

SPOTS • DRILLS • BORES • REAMS All Holes with Minimum Tool Changes

A glance at your blueprint...a few turns of the lead screws and *all* holes on the work piece are quickly located and spotted—*consecutively, accurately*. It's as simple as that. There's no waiting for tool changeover on each individual hole, for the Moore Jig Borer drills, bores and reams *all* holes in rapid sequence with minimum tool changes.

Contrast this *built-in* system of coordinate location with the laborious size blocks or graduated scale methods of measurement, plus the continual stop-and-start required with tool changes at every hole.

Guaranteed to space and bore holes accurately within limits of .00025" in *any* position of the table, the Moore Jig Borer is ideally suited for jigs, fixtures, dies and gages as well as for jig-less small-lot production.

Investigate its advantages in your applications. Write for our descriptive literature.

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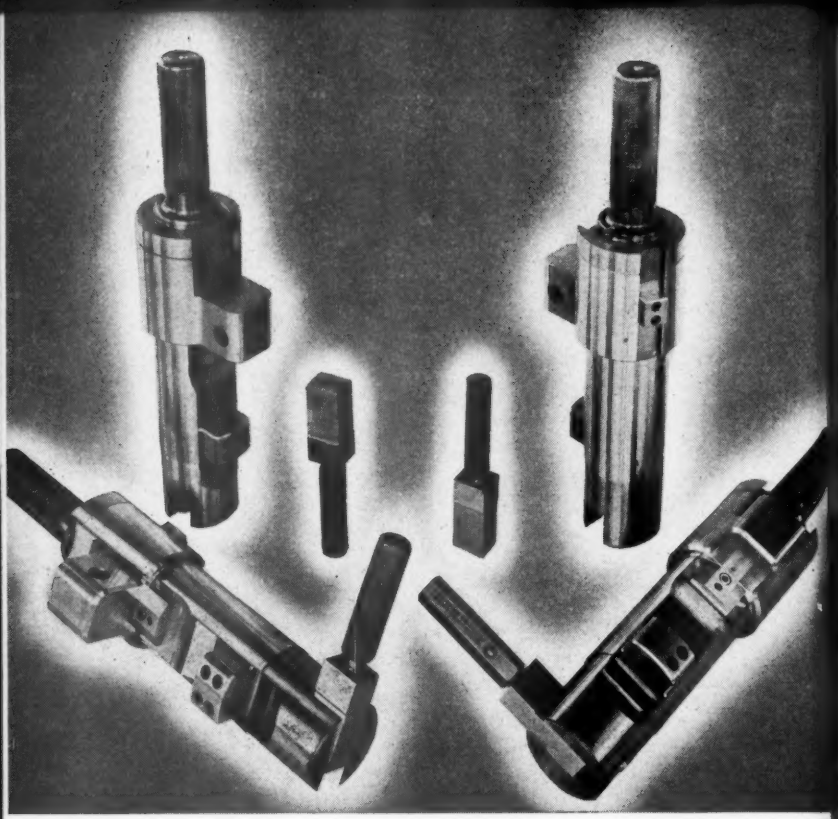
MOORE JIG BORER



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Our experience as Army and Navy materiel tool and gage makers will be incalculably valuable to manufacturers when their conversion to peacetime production requires prompt delivery of dependably accurate Gages, Jigs, Fixtures and other Special Precision Tools. We also specialize in Thread Grinding. Our inspection meets the most exacting specifications.

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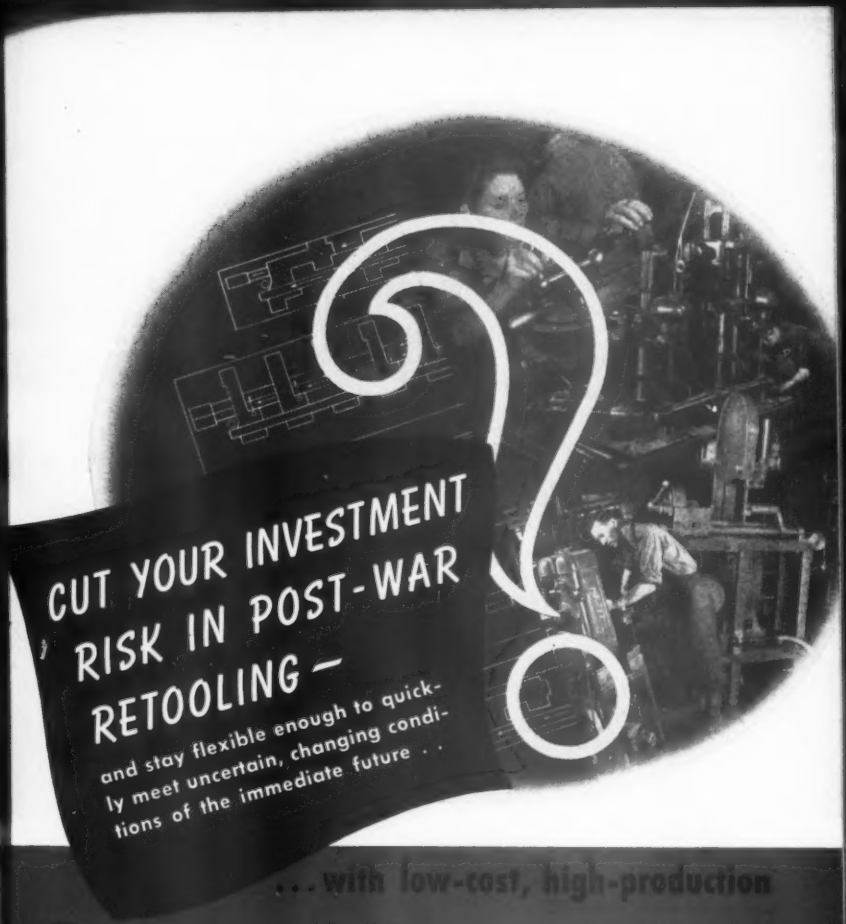
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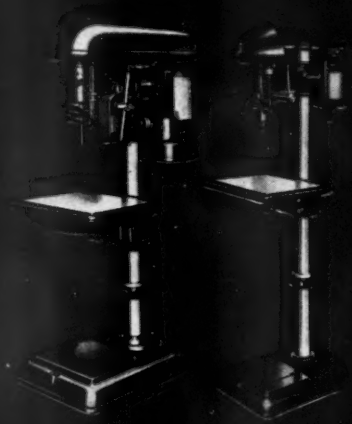
and stay flexible enough to quickly meet uncertain, changing conditions of the immediate future . .

. . . with low-cost, high-production

Delta-Milwaukee Machine Tools

TURN THE PAGE!



140 case histories of war production experience in

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suggest money-saving peacetime applications in your plant

This book can help you more clearly visualize the versatility of Delta-Milwaukee Machine Tools. • It may suggest — as it has in many cases — using regular stock-model Delta elements to build special-purpose machines . . . or modernizing obsolete machines with standard Delta units . . . or using low-cost Delta tools to quickly revise production-line layouts. • This modern way of retooling holds your capital investment to a minimum. Delta cost savings are due to modern production methods applied to a large volume of standard models. • Also available is a catalog. Send for both books.

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Eliminates expensive finishing. Three models — with abrasive wheel, for cutting steel; with steel blade, for cutting plastics and non-ferrous metals; with cross-cut blade, for cutting wood. Low in cost.

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CHICAGO GRINDING WHEELS—Anything up to 3″ in diameter in various grains and bonds, including FV, the sensational new bond with a pedigree.

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Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Abrasive Industry

TRY ONE FREE! So you'll know what they can do, we will send a test wheel. Tell us material you'd like to finish and size wheel required.

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...Has Re-ordered Over Period of 7 Months, for 7 Different Plants!

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In 16", 20", and 24" Sizes

Check These Outstanding Features:

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SAFETY DEVICE
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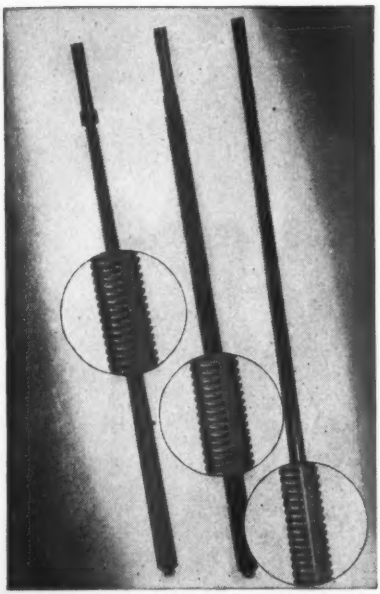

• 56 inches long overall, the above three broaches were used to perform the operation illustrated below.

Now, it takes only 1/40th the time to perform this operation!

New method of producing cutting face and chip area in threading dies

Here is a graphic illustration of how the U. S. Broach engineers solved one manufacturer's production problem by designing these clover leaf shaped broaches to save him valuable man and machine hours.

If you have a problem in the precision cutting of production parts you will find that our engineers' wide experience will be helpful to you in affecting greater economy in your plant.

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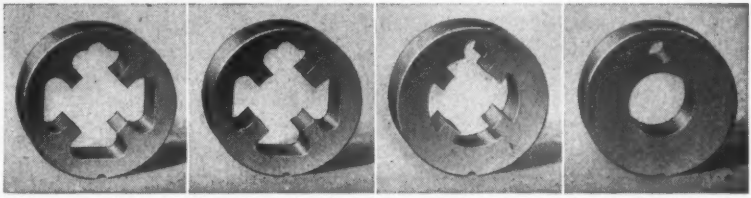

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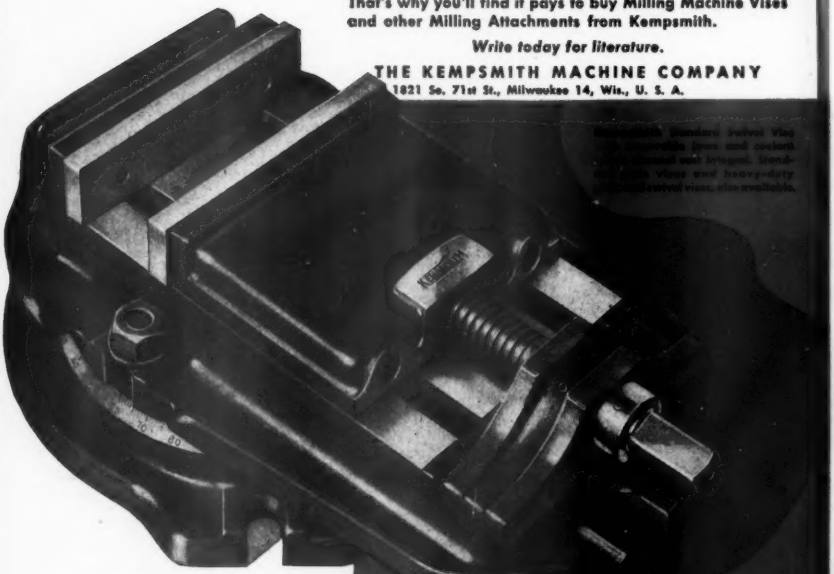

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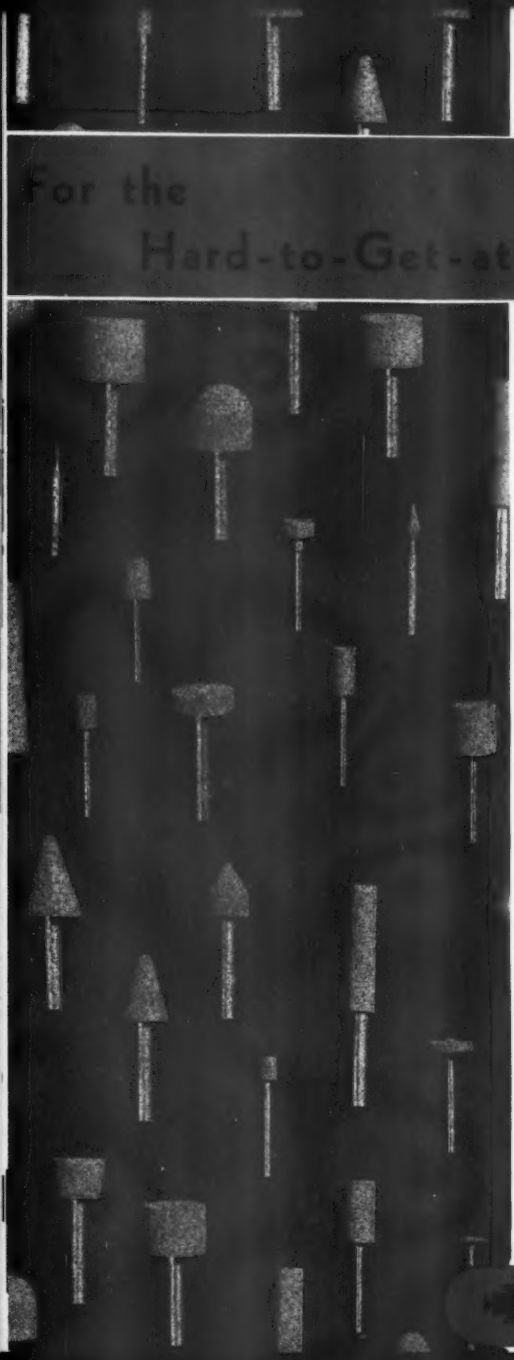

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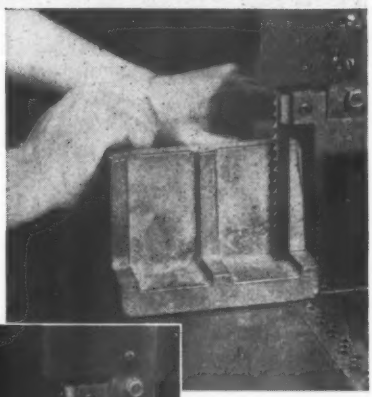

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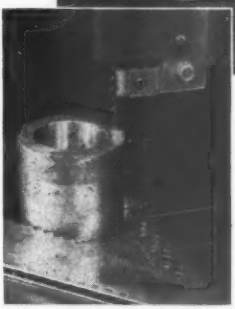

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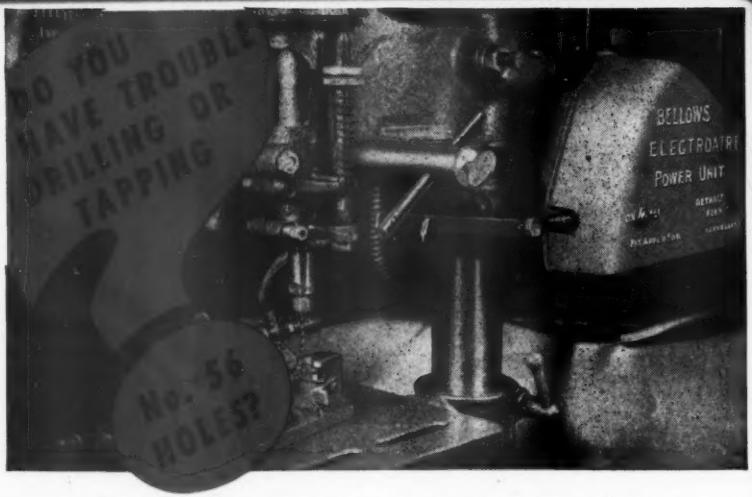

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Yes—it will be good to have all the "Eddie's" on the job once more, showing you new products, helping you locate the hard-to-get items, pointing out new ways to cut costs and speed production. In the meantime your *Industrial Supply Distributor is worthy of all the cooperation you can give him. Short-handed and harassed, has he not been doing a pretty good job of taking care of your requirements during the present emergency?

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AMERICAN INDUSTRY AND FOREIGN POLITICS

BY comparison with the business philosophies and industrial systems which prevailed in the world's great nations before this war, American industry and business are thoroughly democratic. We have our power-loving individuals and groups but they come and go. Corporations attempt their patent pool controls and so we have our anti-trust suits. Labor union chiefs with their large worker organizations high-pressure industry for additional advantages and we set up compulsory arbitration. Powerful farmer organizations develop their co-operatives and frighten their competitors who have operated for years along conventional lines. Therefore we have arguments for tax control of "co-ops".

For this writer these efforts and actions, counter-efforts and counter-actions are proof that we as a nation have a sound philosophy of business and system of enterprise. They have provided us with the world's highest standard of living. They have enabled us to achieve industrial supremacy to a degree never before attained. They have encouraged and accomplished food production and processing equal to the extraordinary demands put upon us by the crop failures and shortages of the world's embattled nations.

Although we must guard against the conceit of perfection we are willing to be known by our works. We, as a nation, stand ready to defend and prove our philosophy of "free enterprise" and our system of "private enterprise" before the world. We cherish the right of a man to build his security with his God-given intelligence, courage and strength just as we do our rights to enjoy freedom of speech, of press and of religion.

So certain are we that these are man's supreme privileges that we have thrown ourselves, our families and our resources into the gigantic effort to defeat nations whose philosophies and ideologies are unnatural, retrogressive and unchristian.

Americans know more about their own country than the citizens of any other large nation do about theirs. Although they do not exercise the privilege nearly as effectively as they could and should, it is true notwithstanding that their expressions of opinion constitute a force which encourages or deters our public servants. We discuss, we argue, we write—freely and unrestrictedly. The White House, the Capitol, the State House listen and eventually act accordingly.

Now this is the year of years for the widest possible exercise of this privilege of expression and determination. The men we have elected to public office are carrying great responsibilities. They need and should want to know the "will of the

people". Let the voice of public opinion become ever louder and clearer so that it may be heard even around the world.

Repeatedly we have been accused of declaring our high ideals but taking no steps to effectuate them. Now is the time to develop a "technique" by which we can sell to the *peoples* of the world an American Policy of Good-will. Its platform shall consist of our own Bill of Rights which we know is a workable formula, the Atlantic Charter to which our Allies were *moral* subscribers even if not actual signatories and, lastly, the terms agreed upon at the Dumbarton Oaks Conference.

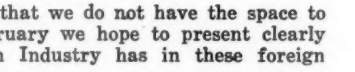
In his message to the 79th Congress last week the President took the first step toward *re*-assuring the confused nations that we "will be in there pitching" when they need help and encouragement in the readjustment of their political affairs.

In those months to come when the war-weary peoples of Europe must be rehabilitated it will be difficult for our officials and representatives to assist them unless they are able to convince them of our sincerity and good-will. Equally important, we must be prepared to see them through to better days because it is conceivable that even a people who could benefit most from the freedoms under our kind of government might not know how to make use of their privileges.

But even more difficult foreign assignments have to do with our own Allies. To convince them that we are in earnest about the application of Atlantic Charter and Dumbarton Oaks provisions such as the right of a people to determine their form of government and to conduct elections we may have to bring to bear the full weight of our nation's collective opinion.

Before and during this war we have given convincing proof of our willingness to share our resources, goods and men. Many of our citizens still believe that in Europe we are fighting someone else's war, but be that as it may we do not see where our good faith can be questioned. Therefore we have a right to expect frankness and collaboration from our Allies. We believe emphatically in the rights of small nations and we hold that they should be respected. The large majority of us do not like high-power politics and public opinion holds that it is not conducive to mutual trust to be informed by an Ally that Athens is to be treated as a conquered city and again that our insistence upon the feeding of starving Italians would be displeasing and would even be considered justification for the use of strong language in opposition to plans to distribute our food as a means of quelling unrest.

It is a matter of regret that we do not have the space to finish in this issue. In February we hope to present clearly the interest which American Industry has in these foreign political events.



Editor

A COMBINATION BLANK, DRAW AND PIERCE DIE FOR AN ALUMINUM STAMPING

by Edward Heller
CHIEF ENGINEER
Ohio Tool Company
Cleveland, Ohio

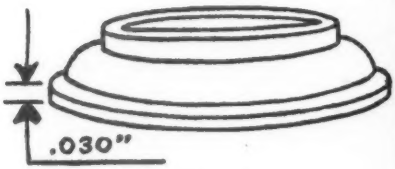


FIG. 1

The accompanying illustrations show a die for making an aluminum stamping, Figure 1, in one operation. The cross sectional elevations of the tool show most of its features: *A*, Figure 2, is the blanking die ring; *B* is the blanking punch which is also a part of the upper forming die. The ring *C* constitutes the rest of the forming die and acts also as a knockout.

On the lower part of the die, *D* is the forming stake which also serves as piercing die, while *E* is the pressure ring. *F* in the upper part of the tool is the punch for piercing the hole in the top of the stamping.

In operation, the strip stock is laid on the top of the die against the gage

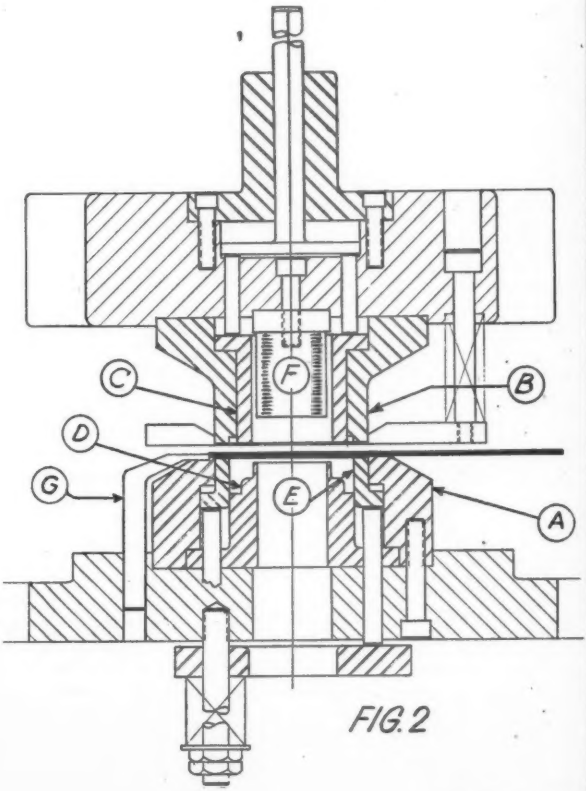


FIG. 2

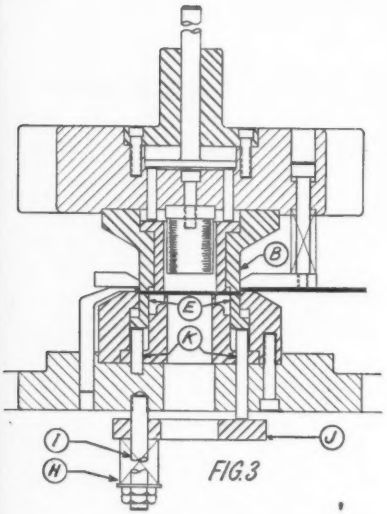


FIG. 3

G, Figure 2. When the press is tripped, punch *B* shears through and grips a disc betwen itself and the pressure ring *E*, Figure 3. Ring E derives its pressure from two springs *H* (only one shown) on studs *I* through plate *J* to pressure pins *K*.

On the way down the stamping begins to assume shape as it is being wrapped around stake *D*, Figure 4. At the proper time, piercing punch *F* comes in contact with the work and knocks out a slug, Figure 5. From that moment most of the material is taken from the top rather than from the lower flange.

As the operation continues, Figure 6, and the stroke reaches within a metal thickness of the bottom, the cutting edge *L* on forming die *B* comes in contact with cutting edge *M* on stake *D* and trims off a ring *N* of surplus

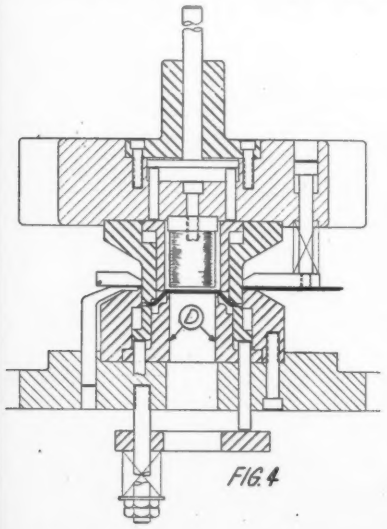


FIG. 4

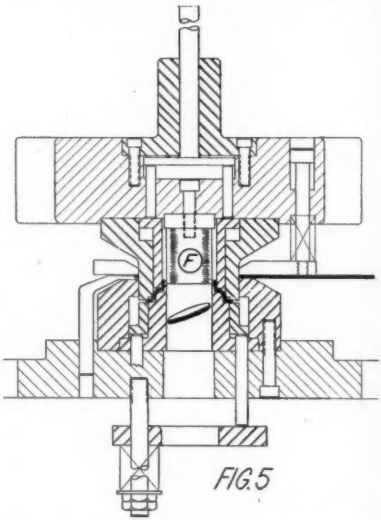


FIG. 5

material, bringing the flange to size and completing the job.

On the way up when the ram of the press reaches the upper limit of the stroke, the knock-off rod *O*, Figure 7, comes in contact with the positive knock-out mechanism in the press. The rod causes plate *P* to force knock-out pins *Q* down, which, in turn, force knock-out ring *C* down and thus shed the stamping out of the upper member of the tool. The scrap, *V*, Figure 6, of the strip which clings to the blanking punch *B* is removed by a conventional stripper *R*, Figure 7, suspended on stripper bolts *S* and actuated by springs *T*.

It should be noticed that while the blank size can easily be determined after a few trials, the determination of the size of punch *F* is a little more ticklish. But even in that case there is a

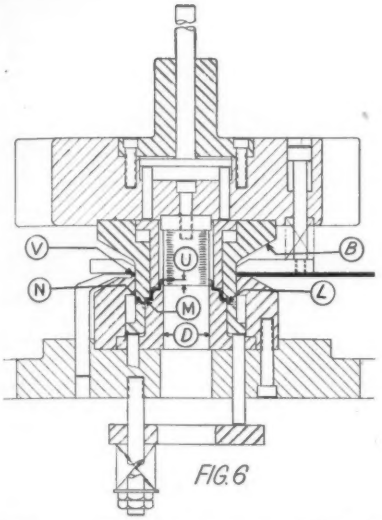


FIG. 6

way out. The size bears a relation to the distance *U*, Figure 6, between the end of the punch and the top of stake *D*. If the hole in the top of the stamping is too large, the punch *F* must correspondingly be shortened, while if it is too small it might have to be shimmed down so as to cut earlier in the operation.

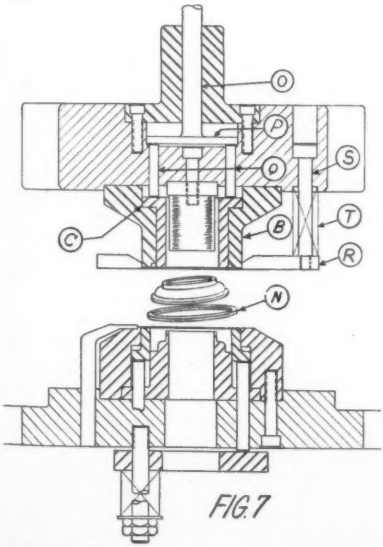


FIG. 7

Industrial Plastics

"Industrial Plastics" announced elsewhere in this issue is the logical development of the department of the same name which TDJ readers have built by their interest. In keeping pace with the demand for more and more technical data and practical, useful information, the department has literally outgrown the space which could be allotted to it. The editorial field of "Industrial Plastics" is the design, construction and use of tooling and equipment for processing, fabricating and finishing of plastics formulations.

The technical and practical problems of the major elements of the plastics industry—the material manufacturers and distributors, the custom molders, the mold and die designers and builders, the plastics processing equipment makers, the standard machine tool manufacturers and the suppliers of special tooling, testing and control devices will be given first consideration. The emphasis will constantly be on the practical side.

An Editorial Advisory Board is in the process of formation. The collective "know-how" of these men covers every important and significant phase of the industry. In this way suggestions and recommendations are fully utilized so that not only the most pertinent subjects and problems are covered in an editorial program, but that the most competent specialists are selected as contributors.

Departments have been set up to give adequate coverage on the phases of the industry that center around processing and fabrication. The interests of the molder and fabricator will be given first consideration. Information on new or improved materials will be screened from this point of view. Essential data on new machines, materials and equipment, news of associations, companies, plants and individuals will be given by alert field or shop-minded staff members.

Men in the precision metalworking industries who have a specific interest in plastics are invited to ask for copies of the first issue. Copies will be distributed, in addition to the circulation we have already verified, as long as a limited paper supply will permit. Request promptly on company letterhead, give name, title or department, and specific plastics activity or interest.

APPRENTICESHIP—AN EDUCATION AND AN OPPORTUNITY*

The value of apprenticeship as a medium for developing knowledge of a craft and acquiring technical information was sharply focused in Connecticut when B. J. Lazan, vice-president and chief engineer of the Sonntag Scientific Corporation was awarded the Nobel prize for his paper, "Some Mechanical Properties of Plastics and Metals Under Sustained Vibrations." This prize was awarded for the most valuable contribution in the field of engineering during 1943.

In November of 1942, the Sonntag Scientific Corporation established an apprenticeship program under standards in cooperation with the Connecticut State Apprenticeship Council. The Company employs only twenty-nine workers, five of whom are apprentices. Four of these apprentices are learning the toolmaking trade and one is an apprentice draftsman. Under the program of training established by the Company, the apprentices are assured training under the close supervision of craftsmen on the operation of the basic machine tools so that they can turn out the required parts and tools from blueprints. They also attend the Stamford Trade School for classes in technical subjects related to their trade. Not only are these boys acquiring this fundamental knowledge, but surrounded as they are by an atmosphere of experimentation and development, in constant touch with new engineering ideas which it is their responsibility to transform into realities capable of performing the functions for which they are designed, these apprentices are acquiring technical knowledge and experience of a very high order.

This Company is engaged in developing machines for dynamic testing of structural metals, as well as non-metallic materials. The progress of the apprentices under this program has been rapid and thorough and the Company has expressed real enthusiasm at the way the apprentices have been able to assume responsibility and perform assigned tasks. There is no question in the mind of the president of this Company, Mr. Alfred Sonntag, that the opportunity for the development of trade skills, technical knowledge and an experimental attitude which the Company, makes available to its apprentices will bring results beneficial to the Company, to the apprentice and to the community.

The specific program laid out for the draftsman apprentice involves working directly on design under the supervision of the chief engineer, B. J. Lazan, who spends upwards of four hours a day at the drawing board explaining to the apprentices and other draftsmen what is being done, the reasoning and techniques pertaining to quality, strength, appearance, serviceability and performance. Since every design is a compromise of all these factors, the advantage to the apprentice in having the opportunity to hear these design calculations explained is apparent. After receiving instructions from the chief engineer, the apprentice is often left on his own to develop the modification of design, details and new features it is desired to incorporate in the drawing. Mr. Sonntag is also keenly interested in the apprentices and devotes considerable time to supervision and advice on technical

*** From the October, 1944 issue of "Connecticut Industry" published by the Manufacturers' Association of Connecticut, Inc., L. M. Bingham, Editor. Here is a case history of an apprenticeship program intelligently and enthusiastically conducted by a small but most progressive manufacturer. Our readers will agree, we feel sure, that any boys fortunate enough to be beneficiaries of such an intimate and well-rounded course of training are destined to become in the fullest sense, our future master mechanics.**

engineering problems. It is apparent that the Company's objective is to give complete all-round training in mechanical design which includes the theory of engineering so as to enable the apprentice to independently design new products.

Toolroom apprentices work under the supervision of the toolroom superintendent, who is a graduate mechanical engineer.

The functions and purpose of the product to be made are explained to each apprentice as he is assigned a job. He is also shown why certain operations and techniques are necessary to accomplish desired results in turning out precision tools and instruments which vary in size from those weighing only a few ounces to others weighing thousands of pounds. Since the Company manufactures only special equipment, a considerable variety of work is assured to each apprentice.

To appreciate what this means, one must view this training against the history of invention and development in the Industrial Age. We find from such an analysis that many of the inventions which have made possible the Machine Age have stemmed from men who had first mastered a trade, thereby providing them with the basic skills and fundamental knowledge which made possible the development of their ideas into practical realities. In many cases these men had not had formal training in technical schools, but had acquired skills in the particular crafts in which they worked. From this type of background came such Connecticut men as Eli Whitney, inventor of the cotton gin and the milling machine, and Sam Colt, inventor in the field of firearms. These are only two examples of the many Connecticut craftsmen whose products and names are known all around the world.

The lessons of the past, the opportunities of the present and our prospects for the future are bound up with our appreciation of the values inherent in the skilled worker. This can be seen more clearly at a small firm such as the Sonntag Scientific Corporation, where apprentices properly selected are being matured into creative craftsmen in an atmosphere and with the facilities which make possible the full development of their creative abilities. However, similar opportunities exist for the development of craftsmen in many Connecticut concerns. Where these opportunities do exist, programs of training looking toward the development of trained craftsmen should be undertaken under basic standards which will assure the company, the community and the apprentice of the competence which is needed. It was for promoting this purpose that the State Apprenticeship Council was formed in 1938, and it is toward this goal that the State Council, composed of management, labor and public representatives, is aiming. Already more than one hundred Connecticut concerns have adopted approved apprenticeship programs and standards. This number should be substantially larger if Connecticut manufacturers and labor organizations are adequately to discharge their responsibility to the future of this State.

In the immediate future we can expect many returned veterans, whose normal education and training were interrupted, to again take up preparation for their life work. Many of these can and will find valuable opportunities in learning a skilled trade. Under the apprenticeship program sponsored by the Connecticut State Apprenticeship Council, this skill can be acquired while at the same time the veteran is able to earn a reasonable wage for work performed. In this way the veteran can assure his own future because experience has shown that broad knowledge of a basic trade makes possible a high level of average earning, stability of employment and opportunities of advancement to supervisory and executive positions. At the same time, industry can both assure a continuing supply of the skills necessary to carry on and expand production in the State and help to solve the difficult problem of veteran rehabilitation which faces us.

Connecticut industry, both labor and management, should get solidly behind the State Apprenticeship Council program. Leadership in the development of fine craftsmen is necessary if this State is to maintain its preeminent position in the field of fine manufacturers and give real meaning to the terms, "Yankee ingenuity and inventiveness" by which the workers of the State have been characterized in the past.

ADVANTAGES AND CHARACTERISTICS OF LIGHT METAL PERMANENT-MOLD CASTINGS

by L. F. Swoboda
DEVELOPMENT ENGINEER
Aluminum Company of America
Cleveland, Ohio

Cost conscious postwar planners can well benefit by Mr. Swoboda's treatment of this specialized technique as presented before the recent Los Angeles National Aeronautic Meeting of the Society of Automotive Engineers.

The remarkable service which light-metal castings have provided in various war applications can be attributed in no small way to the development and improvement of the permanent-mold casting process. Aluminum and magnesium alloys, in the form of permanent-mold castings, have contributed to increasing speed, efficiency, and range of our fighters and bombers. Light-metal alloy landing and tail wheels plus numerous engine and airframe parts have helped to reduce the weight of warplanes and improve their operating performance. Naturally, these uses represent only a fraction of the light-metal permanent-mold castings which are employed in our war equipment. They are, however, indicative of the quality and usefulness of these light-metal products.

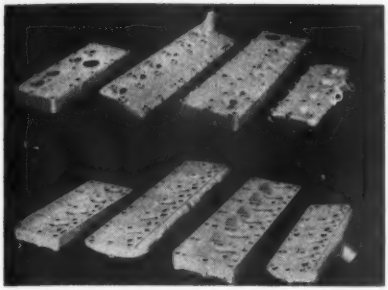
There are many potential advantages afforded by the combination of the permanent-mold process and the light-metal alloys. Too frequently, however, the advantages are not completely realized because the buyer fails to consult the supplier in the early stages of his design. In order to develop the most economical and practical design, it is essential that the buyer and the foundry cooperate from the beginning by discussing all features such as design details, available alloys, and service requirements.

Permanent- and Semi-Permanent Molds

The process of permanent-mold casting, as you may well know, consists of pouring molten metal into a hot metal mold or die. It differs from the die casting process in that the metal is fed into a hot mold cavity by the force of gravity rather than into a water-cooled die by pressure. A variation in the permanent-mold process is also frequently employed which greatly expands the use of the permanent-mold process. It consists of using a dry sand core for the interior surfaces and a metal mold for the exterior surfaces. This semi-permanent mold method is used when it is impossible to remove steel or iron cores from the interior of the finished casting. It may also be used when a smoother surface is required on the exterior than could be obtained if the part were made as a sand casting. Furthermore, by the semi-permanent mold method most of the metallurgical advantages of the permanent-mold process can be obtained even though dry sand cores have to be used in part.

Metallurgical Characteristics

Castings made by the permanent-mold process have many advantages, the most outstanding of which is their metallurgical superiority over other cast products. If the metal is correctly poured into a properly designed mold (assuming the casting is well designed for the process), solidification takes place progressively; that is, the part of the casting farthest removed from the



Four automotive cylinder heads made by the semi-permanent mold process. The combustion chambers and all other surfaces are formed in metal molds, and the water passages are formed by sand cores. Note the cored bolt-holes and the smooth combustion chambers, accurate in volume to ± 1cc. This is an outstanding example of the semi-permanent mold technique.

sprue and risers solidifies first and is fed by the successive additions of molten metal as the mold is filled. It is this progressive feeding of the casting, together with the rapid chill the metal receives on coming in contact with the metal mold, that produces a dense, fine-grained metal, the mechanical properties of which are substantially higher than those obtained in other type castings. Furthermore, the physical properties are also enhanced by the fact that well designed permanent-mold castings are unusually free from the more common foundry defects, such as dross, air pockets, and porosity.

Tolerances

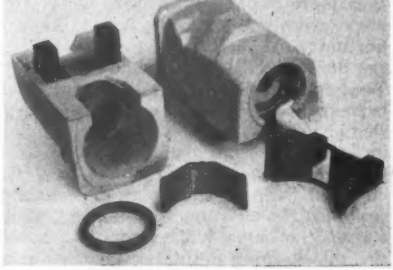
The general soundness of permanent-mold castings also reduces the losses resulting from foundry defects which may be uncovered during the machining and finishing operations. It is frequently found that the amount of finish necessary for machining may be reduced below that required for sand castings, and since the essential surfaces of the casting can be made smooth, for many purposes finishing operations may be eliminated. As the result of the smoothness and accuracy possible with the permanent-mold process, many holes can be cored to size, thereby eliminating this machine operation entirely.

Pressure tightness is another advantage which is inherent in permanent-mold castings. This quality is often the determining factor in selecting permanent-mold castings rather than sand castings for a specific application.

Permanent-mold castings are not precision products and, consequently, certain tolerances cannot be held too closely. Their dimensional accuracy, however, is intermediate between that of sand castings and die castings. Somewhat greater tolerances are necessary in semi-permanent mold castings, especially when a fairly large portion of the surface is in contact with sand.

Cost Factors

A number of factors are involved in determining the cost of permanent-mold castings. When comparing the cost of permanent-mold equipment with sand foundry equipment of similar production capacity, it is frequently found that the cost sometimes favors one process and sometimes the other and only a careful analysis of the factors involved will give the answer. It must be remembered, however, that when a large number of castings is involved, the mold cost becomes a practically negligible item. As the number of castings produced increases, the initial cost of the mold is distributed over a greater number of items. Furthermore, it is the foundry's responsibility to maintain or replace permanent-mold equipment so long as it is considered active, and the buyer has



Front and rear views of a magneto housing and its three cast-in inserts; one of many permanent-mold jobs requiring the casting-in of inserts.

only the cost of the first mold to consider. On the other hand, it is the buyer's responsibility and expense to keep sand foundry equipment in good repair.

Finishing

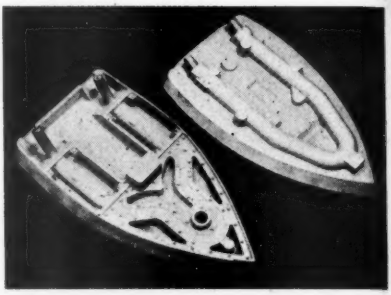
It may also be found that the smoothness and accuracy of castings produced in permanent molds frequently permit a reduction in the extent of finishing operations necessary, or that such can be eliminated entirely from some surfaces. This reduction in the amount of finish stock results in lighter and consequently cheaper castings. In some cases the decreased amount of metal which must be removed from an individual surface of a permanent mold casting will alone result in attractively lower machining costs, but usually the thickness of metal removed is not nearly so important as the comparative uniformity of a casting.

The efficiency of a large production machining setup is influenced by the uniformity of the castings. Because of their greater uniformity permanent mold castings are less likely to require frequent setup adjustments to insure the cleaning up of all machined surfaces. The time spent in checking and in making these adjustments on less accurate castings decreases the production rate and increases the total machining cost.

Supply Sources

To select a good, reliable supplier is the first requirement of any buyer who plans to purchase light-metal permanent-mold castings. This factor becomes even more important in cases where the buyer's designers have not had the opportunity of becoming experienced in the development of this type of casting. The opportunity of using light-metal permanent-mold castings, however, should not be overlooked simply because an experienced designer is not available. Good, economical castings can still be obtained with the aid of an experienced supplier. In addition, through this association the buyer will gradually acquire the knowledge of designing for the light-metal alloys and the permanent-mold process.

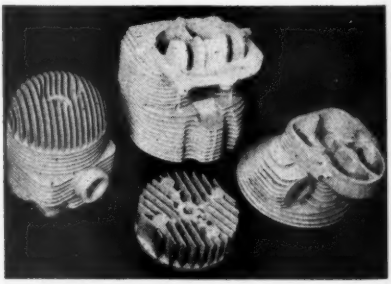
The supplier's experience in casting design, alloy selection, mold construction, and foundry practice is invaluable to the buyer from a cost standpoint. Consequently, it is to the buyer's best interests to select a supplier that has skilled personnel and adequate equipment.



Two designs of electric, hand iron sole plates. Note the cast-in cal-rod heating elements. Alloy No. 138, which has high hardness in the "as cast" state and maintains it at operating temperatures is used almost exclusively for sole plates and similar parts.

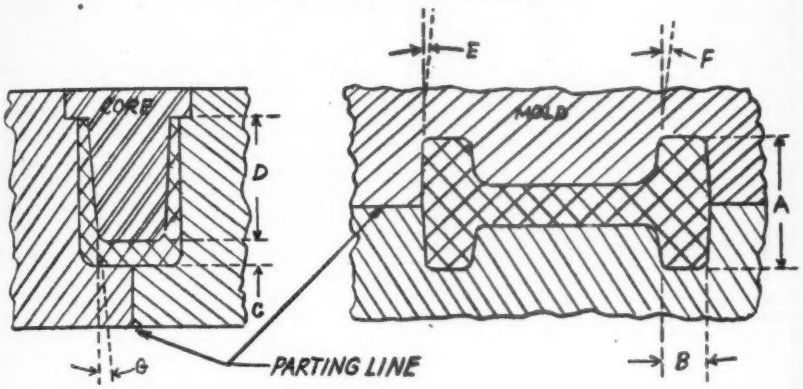
Design Experience

Skilled casting designers can usually design the parts to make them adaptable for the permanent-mold process without sacrificing their appearance or utility. By anticipating the problems of mold designers and foundrymen, they



Four finned castings. The casting at the extreme left is a one-piece cylinder barrel and head casting and is a full permanent-mold casting, as is the small, flat cylinder head shown at bottom center. The two aircraft aircooled cylinder heads are semi-permanent mold castings because of their port construction details. Weights range from 1.6 to 9 lbs.

Table 1—Permanent Mold Tolerances



A ACROSS PARTING LINE

± 1/64 For one inch or less—above one inch add .002 to tolerance per inch of length.

B BETWEEN POINTS PRODUCED BY ONE PART OF THE MOLD

± 1/64 For one inch or less—above one inch add .001 to tolerance per inch of length.

C BETWEEN POINTS PRODUCED BY THE CORE AND MOLD

± 1/64 For one inch or less—above one inch add .002 to tolerance per inch of length.

D MAXIMUM LENGTH OF CORE WHEN SUPPORTED BY ONE END

Diameter of Core X 10.

E OUTSIDE DRAFT

1° Minimum — 3° Desirable.

F DRAFT IN RECESSES

2° Minimum — 5° Desirable.

G DRAFT ON CORES

1/2° Limited — 2° Desirable

NOTE:

1. Minimum Diameter of Cores — 1/4

2. Minimum Web Thicknesses for Distance of:

Three inches or less — 1/8

Three to six inches — 5/32

Over six inches — 3/16

3. Machine tool locating points should be indicated.

4. Allowances for Machining:

Castings up to ten inches long—1/32 minimum — 3/64 desirable.

Castings over ten inches long — 3/64 minimum — 1/16 desirable.

Surfaces formed by sand cores—1/16 minimum.

5. Minimum Radius of Fillet

Radius should equal average thickness of joining walls.

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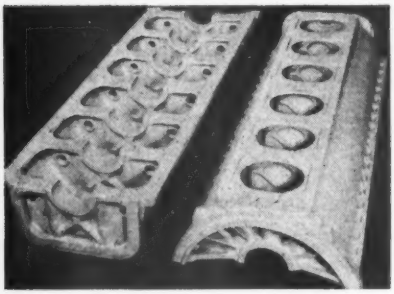
can incorporate features in the design which will facilitate the manufacturing process and result in sound metal throughout the casting.

The designer should also be responsible for the selection of alloys and heat treatments. By knowing the physical and mechanical properties of the available alloys and their effect on fabrication, service life, and the final cost of the casting, he can specify the alloy which will best meet the anticipated service conditions.

The skilled mold designer, by virtue



A semi-permanent mold crankcase. This case is approximately 42″ long and weighs approximately .75 lbs. This casting originally was made in sand molds but it was necessary to change to the semi-permanent mold method in order to get the increased strength required when the power output of the engine was stepped up.

of his experience, can incorporate features in his designs which will produce sound, uniform castings without resorting to expensive and time consuming cut and try methods. A good supplier should also be equipped to exercise close technical control.

Facilities

To give the buyer the lowest mold cost and quickest delivery date, it is essential that the foundry have access to a well equipped and well manned machine shop. In addition to the usual standard machine tools and power driven flexible shaft tools, duplicator and profiling machines are very desirable. A large number of standard and special milling cutters are also necessary, but a well rounded supply of such cutters is usually accumulated only after years of mold building.

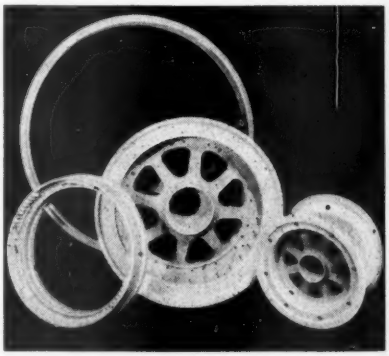
Design Factors

There are a number of important factors which should be considered during the design of light-metal permanent-mold castings. A careful analysis of these factors will aid the designer in obtaining higher quality and greater economy. For example, a large percentage of castings now made in sand molds could be made in permanent molds without resorting to design changes. With a few minor changes in design, however, it is frequently possible to obtain greater production, to simplify the mold construction or, as the case may be, to permit the use of a full permament mold instead of a semi-permanent mold.

Cores

One of the chief requirements in the design of permanent-mold castings is to allow for the withdrawal of cores from the casting and the removal of the casting itself from the mold. In some instances, the castings are of an inherent design which cannot be changed sufficiently to permit the use of a solid core. For this class of castings, it is necessary that split cores, multiple piece molds, or sand cores be used. In other cases, however, a permissible change in design will make possible the use of a single piece core, thereby reducing the production costs.

When castings are being designed to facilitate their production, the designer should strive for a minimum number of cores, since their replacement in the mold requires more handling and slows down

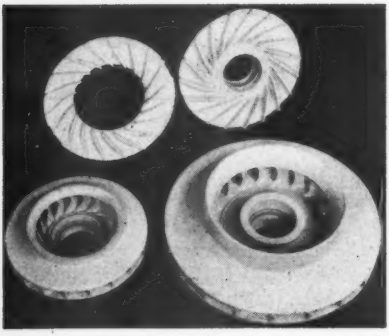


A group of both permanent mold and semi-permanent mold castings. The large ring is almost 40″ in diameter and weighs between 25 and 30 pounds. The smaller ring weighs approximately 25 pounds and is approximately 20″ in diameter. Note the spiral locking threads and the integrally cast teeth in the small ring. Both landing wheel castings are made by the semi-permanent mold process; the large wheel weighing approximately 100 pounds and the smaller 20 pounds.

Table No. 2

Properties of Some Light-Metal Permanent-Mold Alloys

Alloy & Ht. Treat. (Alcoa Numbers)	TYPICAL PROPERTIES				CHIEF CHARACTERISTICS and APPLICATIONS
	TENSION			Brinell 500 Kg. Load, 10 MM Dia. Ball	
	Yield Strength Lbs./Sq. Inch (Set = 0.2%)	Ultimate Strength Lbs./Sq. Inch	Elongation Percent in 2 Inches		
43	9,000	24,000	9.0	45	Alloy has excellent casting characteristics, casting well in thin sections; excellent weldability; fair machinability; good leak tightness; good corrosion resistance; excellent Alumilite characteristics.
B113	19,000	28,000	2.0	70	Excellent casting characteristics; a good general purpose alloy; excellent machinability; good weldability.
C113	28,000	30,000	1.0	80	Excellent casting characteristics; good leak tightness; a good general purpose alloy having greater leak tightness and higher yield strength than obtainable in B-113 alloy.
A132-T551	28,000	36,000	.5	105	Fairly good foundry characteristics; approximately 15% less thermal expansion than in other aluminum alloys; good high-temperature properties, particularly in 500-600 °F range; takes a good Alumilite coating. This alloy and heat-treat combination is used for cast pistons of all types and sizes.
138	24,000	28,000	.5	100	Excellent foundry characteristics; retains its hardness well at elevated operating temperatures. Used for electric hand-iron sole-plates.
B195-T6	33,000	45,000	7.0	90	This alloy in the condition noted combines good foundry characteristics with good physical properties, good machining qualities, and shock resistance. It is possibly the most generally used of the heat-treatable alloys.
A214	16,000	27,000	5.0	60	Fair foundry characteristics; excellent corrosion resistance; excellent machinability; takes a good Alumilite coating; welding is not recommended. This alloy particularly suited for cooking utensils.
355-T6	27,000	43,000	4.0	90	Excellent foundry characteristics; good leak tightness; good weldability but must be heat-treated after welding; takes a good Alumilite coating; good corrosion resistance; good machinability.
AM240-T6	16,000	35,000	4.0	60	Magnesium base permanent-mold alloy. Good casting characteristics; good mechanical properties; good leak tightness; excellent machinability; weighs only .066 lbs./Cu. inch. A good general purpose alloy.
AM260-T6	20,000	38,000	3.0	78	Magnesium base permanent-mold alloy. Good foundry characteristics; good corrosion resistance; good pressure tightness; excellent machinability; weighs only .066 lbs./Cu. inch. The alloy is widely used for highly stressed and intricate structural castings.



Two sizes of supercharger rotor. These castings are an outstanding example of what can be accomplished by early and close collaboration between buyer and supplier. Originally, such parts were "hand made", being built up from individual steel components. When these hand made rotors were no longer available in the required quantities, the buyer considered semi-permanent mold castings. The aerodynamic characteristics demanded smooth, uniform passages, and the high operating speeds demanded perfect balance and maximum physical strength, especially in the hub section. With these requirements known it was possible to accomplish the desired results. The upper two views show a sectioned rotor. Rotor sizes in this group range in diameter from 9 to 16 inches.

production speed. To minimize maintenance cost extremely long, thin cores should be avoided whenever possible. Furthermore, the number of mold parts should be as small as possible since speed of operation is valuable in maintaining proper mold temperature.

Locating Points

It is necessary for the supplier's designer to know where the jig spots are located. The marking of jigging points on the blueprint will aid the mold designer in placing parting lines, gates, and risers. In addition, the designer should know the exact position of the buyer's locating points so that both the supplier and buyer will check the accuracy of the casting from the same spots.

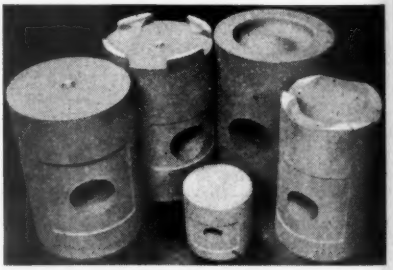
Inserts

It is sometimes found desirable to cast inserts of other metals in light-metal permanent-mold castings. Since the light-metal alloys have different coefficients of expansion from other metals, a definite foundry technique is required for the economical and proper use of inserts.

Section Uniformity

Wherever practicable, uniform sections should be maintained throughout a permanent-mold casting. Section uniformity helps not only to simplify the gating and feeding problem, but also to equalize the rate of solidification, a very important factor in controlling the quality of permanent-mold castings. With any kind of cast product, when sections vary in thickness, there is a tendency to set up internal strains in the casting and cause non-uniform solidification, which may lead to shrinkage and cracking. In a design where light and heavy sections join, a gradual increase in thickness of the thinner section toward the point of junction will help considerably. In service, this blending assists in distributing loads over a larger area of the casting and thereby frequently eliminates undesirable stress concentrations.

The minimum section thickness possible in light-metal permanent-mold castings depends very materially on the



Typical diesel pistons having cast reliefs and various shapes of piston crowns. Most pistons are made from A132 alloy which has 15% less thermal expansion than most other aluminum alloys and also has good high temperature properties.

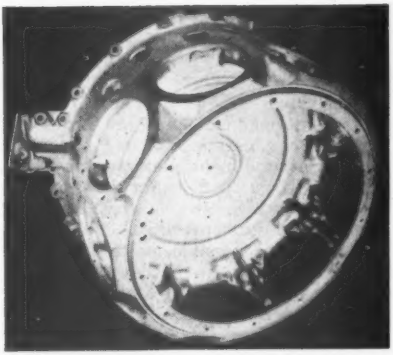
size, pressure requirements, and intricacy of the casting. In general, however, the minimum section thickness which can be cast in permanent molds is approximately ⅛ inch. When extremely thin sections are required, however, it may be necessary to make an engineering compromise since it is necessary to sacrifice some smoothness of surface to attain the desired thinness.

Ribs

Limitations on section thickness also apply to the design of ribs in light-metal permanent-mold castings. Particular attention should be given to thin ribs, particularly those which are highly stressed. Their rapid cooling in the mold may set up casting strains which result in a lowering of the strength of the casting and possibly in cracks. In service, thin ribs may be points of failure, particularly when they are subjected to tension loads. For purposes of minimizing the danger of cracking, the edges of ribs should be blunt, rather than "full-round."

Fillets

The designer should provide generous fillets at all wall intersections in a permanent-mold casting to help prevent shrinkage and cracking at these points. Sharp internal corners constitute a source of weakness in castings and

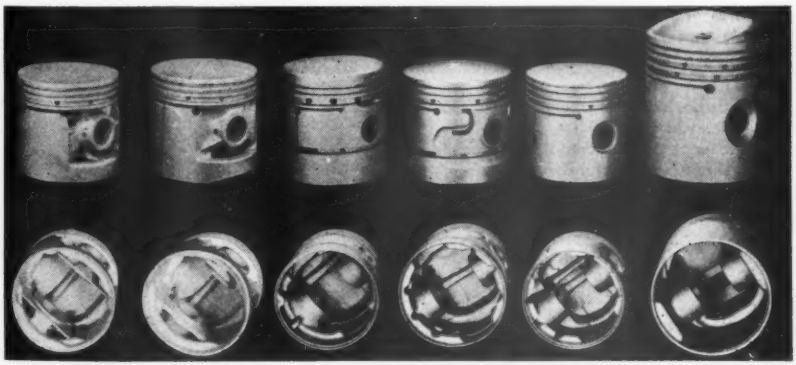


A full permanent mold radial engine crankcase, center section.

should be avoided wherever possible. Likewise, special care must be taken to provide generous fillets where ribs join the supporting faces of the casting, as it is in such sections that many foundry defects occur.

The use of multiple piece and dry sand cores broadens the scope of the permanent-mold process and makes possible the production of some castings that could not otherwise be made by this method. If the "undercut", which necessitates multiple piece cores, can be eliminated however, a saving in cost will result.

The amount of machine finish allow-



A group of six common types of automotive pistons made by the full permanent mold process. Note that some have cast reliefs and some have irregular shaped heads, all cast to size. The inside contours are also intricate but present no special problems to the process.

ance necessary for permanent-mold castings will usually be less than that for sand castings. Naturally, larger castings will require more allowance than smaller ones.

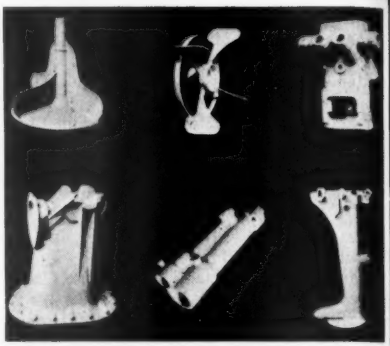
As mentioned earlier in the discussion, light-metal permanent-mold castings have greater dimensional accuracy than sand castings but cannot be held to tolerances which are as close as those possible by the precision die casting process. It is possible, however, to hold certain dimensions—either linear or thickness dimensions—within close limits. In such cases, the closer tolerances may be reflected in the increased cost of the product or in the lower production rate of the mold. From the standpoint of economy, the designer should not specify tolerances closer than are absolutely necessary.

There is no set rule for specifying what commercial tolerances apply to castings of a given size or weight class, because the design details of the various castings have a greater effect on tolerances than do size and weight. The tolerances shown in Table I have been based on years of experience and are considered good commercial practice. This table should, however, be used only as a guide, and whenever any dimensions are to be maintained within certain limits, regardless of what they may be, the foundry involved should be consulted.

In summary, light-metal permanent-mold castings are distinctly a quality product and should be considered when *any one* of the following conditions exists:

(1) Superior cast metal structure is desired.
(2) Smooth surfaces are desired in the as-cast condition.
(3) Uniform size, weight, and section thickness are desired.
(4) Reasonably large production quantities are contemplated.
(5) Most economical production set-up is desired to reduce cost of casting and to maintain a high production rate.

An important fact to remember is that many large castings, as well as medium size castings, can be produced economically by the permanent-mold process.



Two styles of washing machine agitators and miscellaneous brackets. Maximum overall length of castings is 18 inches. Here, both semi and full permanent mold castings are represented.

Furthermore, even experienced people are sometimes unable to tell offhand which process will provide the most economical finished part. In such cases, a complete analysis of all the cost factors entering into the finished part, including the casting cost, finishing cost, assembling costs, and so forth, is advisable.

In closing, we again emphasize the close collaboration between the buyer and the supplier. It is only through this method that the most economical, practical, and serviceable design will result.

Medium size, permanent mold castings, weighing from 3 to 6 pounds. The studs of the lower right casting were cast in place.

WHAT ARE THE LEGAL RIGHTS OF RETURNING VETERANS TO FORMER JOBS?

by Harold J. Ashe

With the conclusion of the European War, employers will be confronted with a reemployment problem of tremendous magnitude, and one which will call for the most complete understanding of the law as it applies to veterans' job rights. A very large part of the returning veterans have prior claims to their old jobs as a legal right established by the Selective Service Act.

Until now veteran reemployment has seldom offered difficulties, either to employers or employees. Job opportunities being greater than labor supply, many veterans have sought out new jobs rather than return to old ones. This current situation has given rise to loose declarations by certain government officials that large numbers of veterans will continue seeking new jobs, lulling employers into a false belief that no reemployment problem will confront them with mass demobilization. The self-evident fact is that today's veteran seeks new fields; tomorrow's veteran, faced with a crowded labor market during reconversion, will value his old job. While only slightly more than a million servicemen have been discharged since Pearl Harbor, once the European War ends, conservative estimates place the monthly rate of discharges at 250,000 or more! This at a time when reconversion will be laying off civilians.

"There is more dynamite in the returning veteran problem than any other which has confronted business since the war began," says O. C. Cool, director of Labor Relations Institute. "It is filled with heartbreak for all concerned." He predicts that the serviceman will "come home to his old boss and say: 'I'm here. I want my job back. The law says it's mine—and you have to give it to me.'"

Who Is Eligible for Reemployment?

Any person, male or female, who, subsequent to May 1, 1940, entered upon active military or naval service, either *voluntarily* or through the draft, is entitled to reemployment status under Section 8 of the Selective Service Act. Such individuals must be able to show employers evidence of completion of satisfactory service. This covers service in the Army, Navy, Marine Corps and Coast Guard, including Wacs, Waves, Spars and women in the Marines. Also covered by a separate statute (Public Law 87, 78th Congress) are members of the U. S. Merchant Marine.

The Act specifically excludes conscientious objectors who have been assigned to work of national importance under civilian direction in lieu of military service. Neither does it apply to members of the Coast Guard Auxiliary.

Veteran Job Reinstatement Requirements

Veterans seeking reinstatement in former jobs must make application to former employers within 40 days after their discharge from the service. They must present evidence of satisfactory completion of service.

These certificates may be (a) Certificate of Service issued by the War Department to Army personnel transferred to the Enlisted Reserve Corps (W. D. A. G. O. Form 280); (b) Report of Separation if such form indicates on line 27 thereof that the veteran received an

honorable discharge (W. D. A. G. O. Form 53); or (c) Any of the certificates of discharge from the Army, Navy, Marine Corps or Coast Guard which entitles a veteran to reemployment rights if otherwise qualified. (See appended table of discharge forms.)

Employer's Obligations

The employer must reinstate such applicants for old jobs to their former jobs or jobs of like seniority, status and pay, provided that the veteran is qualified for the job and the employer's circumstances have not so changed as to make such reemployment impossible or unreasonable. Exception to this rule is in the case of veterans holding temporary positions prior to entering the armed forces.

"The real question," says a memorandum issued by Selective Service, "is can the veteran do his job in the same manner in which he did it before he left? So long as there is any doubt the veteran is entitled to a chance to prove that he can."

The matter of whether the veteran is "qualified to perform the duties of such position" is a question of fact to be determined by common sense and experience and the employer cannot be arbitrary or unreasonable in his standards, nor be capricious.

The veteran is not required to meet higher standards than existed in the position at the time it was vacated by him, nor is he required to meet standards which the employer may set for others with no reemployment rights. If the job has been upgraded, then the veteran is entitled to a job requiring skill comparable to and with equal seniority status and pay to that which he vacated.

Seniority of Non-Veterans

This same Selective Service memorandum points out that qualified veterans are entitled to reinstatement even though it necessitates the discharge of a non-veteran with greater seniority.

Further, on the question of seniority, the Act sets forth that a veteran's active service in the armed forces is applicable to his seniority and that his seniority accumulates for that period in the same manner as though his civilian job had been uninterrupted.

If blanket increases in pay have been granted workers during the veteran's absence he is entitled to these increases upon his return and reinstatement.

A veteran may refuse a position other than his former one, even though the pay is greater and offers other advantages.

A veteran may refuse to go to a city other than the one in which he formerly worked, provided the employer still has a business located in the city of original employment.

If, during the employee's service in the armed forces, the employer has entered into employment agreements with others setting up conditions of employment different from those which existed at the time the veteran left, the veteran cannot be deprived of his reemployment rights by reason of these agreements.

Temporary Employees

Temporary employees do not have reemployment rights. If three successive veterans held the same job, for instance, the first veteran to hold the job, i. e., the first one to enter the service, has prior claim. Several Congressmen are seeking to amend the law so that a second or third veteran may apply and be reinstated if a prior veteran lays no claim to the job.

Permanent vs. Temporary

Selective Service considers the final determination of whether a particular job is permanent or temporary in character as a matter for settlement in courts where disputes arise. Merely as a guide, Selective Service says:

"Generally speaking, one who is employed to fill the place made vacant by a person entering service occupies a temporary status and has no reemployment rights even though he subsequently enters service. There may be exceptions to this, however. For example, suppose that A, a permanent employee, enters service and B, also a permanent employee, is upgraded or transferred into A's place and then enters service; if they return, they are entitled to reinstatement in their original positions. It is the character of the relationship between the employer and employee, whether 'temporary' or 'permanent,' that should govern rather than the particular assignment being carried out at the time of entry into service.

An Invitation

The Editors and Publisher of the

TOOL & DIE JOURNAL

invite you to participate in the development of

INDUSTRIAL PLASTICS

the first issue of which will be ready for distribution on or about April 1, 1945.

INDUSTRIAL PLASTICS, like the TOOL & DIE JOURNAL, its companion trade paper in the precision metalworking field, will devote its editorial pages to authoritative, shop-wise articles, practical engineering data, drawings and illustrations of direct value to industry men responsible for vital plastic and rubber formulating processing and fabricating techniques, the design and construction of tooling and its efficient use in production.

Preliminary discussions with well-informed members of the Plastics and allied industries have brought us counsel, encouragement and promises of co-operation and support.

We extend this invitation with the sincere hope that you and your organization will assist with your suggestions, and co-operate by submitting editorial material.

Advertising space reservations are now being accepted.

Paul L. Reed — Editor
E. Willard Pennington — Associate Editor
Warren V. Prince — Gordon B. Thayer

Contributing Editors

★

George J. Huebner, Publisher

INDUSTRIAL PLASTICS

"I have made the statement on several occasions and I am saying again that the success of any molding application is 90 percent molds and tools . . . you cannot mold a satisfactory part with a badly designed mold. You cannot remove a molded piece from a mold without adequate tools or fixtures. The difficulties encountered by reason of poor mold design or inadequate ejection devices have been only too common. A large percentage of culls which find their way to the scrap barrel have gone there because of inadequate knockout arrangements and fixtures which are just as necessary to a successful molding job as the mold itself."

CARL H. WHITLOCK
Detroit Branch Manager
Monsanto Chemical Company
Plastics Division

THE specific value of INDUSTRIAL PLASTICS to the Plastics and allied industries will be its accumulation and dissemination of practical data on and experience with the design and construction of molds and tools and their use in the manufacture of plastics and rubber parts and products. The vital character of such usable data is perfectly set forth in the statement of a plastics industry authority as quoted on the opposite page.

As the Shop Book of the Plastics and allied industries, INDUSTRIAL PLASTICS will provide also authoritative, descriptive coverage of all equipment available for processing, fabrication and finishing plastics formulations.

EDITORIAL POLICY

INDUSTRIAL PLASTICS, as a department in the TOOL & DIE JOURNAL, has long been favorably known to many members of the Plastics and allied industries. In keeping pace with the demand for more and more technical data and practical information, the department has outgrown the space we can allot to it. The definite emphasis on contributions by recognized technical and business leaders of the industry will be vigorously maintained. This policy, which has been a major factor in the development and present leadership of the TOOL & DIE JOURNAL as the Shop Book of the metalworking industries, provides assurance that adequate top-flight material will be regularly available.

CIRCULATION POLICY

Several years ago we decided that it would be possible to develop with a carefully controlled circulation the most interested and responsive readership a technical journal could have. Thereupon we inaugurated what has come to be known as our CBI circulation policy—coverage according to the Cycle of Buying Influence within each plant. The men who comprise the cycle are almost invariably certified to us as the executives, department heads and key men who specify, recommend and or buy materials, tools, equipment and acces-

sories of every sort. These men will be found in contract mold shops and in custom molders' plants and their tool rooms. Others are technicians in rubber and synthetic molding and fabricating plants, metal, wood and fabric-working shops whose work is related to plastics processing and fabricating and key technical men in the plants of machine and equipment manufacturers and in the organizations of materials suppliers.

FORMAT AND SIZE

The format of **INDUSTRIAL PLASTICS** will follow that of the **TOOL & DIE JOURNAL** which, after more than ten years of publication, has been so often commended as "one trade magazine which I read due to its handy size." Our experience convinces us it is what the shop man wants. Measuring 6″ in width and 8⅝″ in depth, **INDUSTRIAL PLASTICS** is just right for the desk drawer and the pocket. Its page format of two columns of easy-to-read type makes it ideal for the man who must study its pages at night or catch-as-catch-can.

SPACE POLICY

Three covers only are available for advertisements, the front one being reserved for reproduction of products and tools of unusual interest. Advertising rates will be moderate and space will be available as full pages, half, quarter and eighth pages. A rate card is now in course of preparation and will be mailed shortly.

IN CONCLUSION

At this point in the development of the Plastics and allied industries, when so frequently plastics materials are being weighed in the balance as to the practicability of their use for new parts and products the real value of proven techniques cannot be questioned. We sincerely believe therefore that there is a genuine need for placing in the hands of every man who is charged with the responsibility of accomplishment in any branch of plastics manufacture, the most modern subject matter on plastics materials, on effective design of parts and products, and on the most advanced tooling "know-how." To this end the editors and publisher of **INDUSTRIAL PLASTICS** pledge themselves.

"In the case of jobs created by war expansion, the 'permanent' or 'temporary' character of the job *depends upon the facts and circumstances in each individual case.* Some of the factors which may be considered are:

"(1) Was the position newly created.

"(2) Was the veteran the first occupant thereof.

"(3) Was it intended as a 'wartime' or as a 'permanent' position.

"(4) What were the circumstances or agreements at the time of the original employment.

"(5) After the employment commenced, was the relationship between the employer and employee such that they contemplated a permanent relationship in the ordinary sense of industrial and commercial practice.

"These factors are not conclusive or all-embracing. Innumerable unknowns may present themselves in each individual case."

Employer's Changed Circumstances

While provision is made to protect employers whose circumstances have so changed as to make it "unreasonable" or "impossible" to reemploy veterans, such definition must be established by the facts. "Convenience" of an employer is not synonymous with "unreasonable" or "impossible." Examples that will not be accepted as being unreasonable or impossible are cases where the non-veteran to be replaced is receiving less pay than the employer would be required to pay to a veteran. Neither the fact that an employer now employs women in place of male veterans, nor his promise of permanent employment to those who filled the places vacated by veterans is an excuse for failure to reemploy veterans.

Immediate Reemployment

A veteran is entitled to immediate reinstatement. This does not mean "instant", but without unnecessary delay. Mere convenience of the employer is not an excuse for delay in reinstatement of the veteran.

Enforcement

Where an employer fails to comply with the Act, the law provides that the case may be taken to a federal district court, the veteran being given the gratuitous aid of the United States attorney. If the veteran wins the case the employer must reinstate him and pay the employee the wages accumulated during the dispute. Border-line cases, it may be expected, will be settled in favor of the veteran.

No veteran, once reinstated in his job, may be discharged "without cause" within one year.

Administration

Administration of the Act, including Section 8 which pertains to reemployment of veterans, is under the jurisdiction of the Director of Selective Service. He has established, under the law, a Personnel Division with adequate facilities to render aid to veterans with job problems, including those of reinstatement. Local Boards are instructed to handle reinstatement of veterans in their former positions, where assistance is needed. Cases involving possible court action must be forwarded to National Headquarters for review and for forwarding to the Department of Justice for proper action.

Waiver of Veteran' Reemployment Rights

A new development has taken place which should be watched with extreme care by all employers. In a recently issued Local Board Memo (190-A), National Headquarters of Selective Service brings out the fact that a veteran may waive his rights to reemployment under the Selective Service Act, provided however that such waiver is not induced by fraud, misrepresentation or other coercive methods.

In certain instances there will be mutual advantage both to the employer and the former employee for the execution of such a waiver. With this in mind, it can be seen where the employer may, at a later date, find himself in a position where he will need to prove that the waiver was given voluntarily. Against such a contingency the employer should fortify himself with a signed waiver stating the veteran has been offered his old job and that he elected instead, to execute the waiver.

Such a waiver must be demonstrably mutually voluntary, otherwise the veteran, at a later date, may successfully prosecute a claim for back wages. Employers, in such a situation, should not

Table of Discharge Forms

Form No.	Color	Title	Right to Reemployment Benefits of S. S. Act
ARMY:			
55	White	Honorable Discharge	Yes
56	Blue	Discharge	No
57	Yellow	Dishonorable Discharge	No
NAVY:			
660	White	Honorable Discharge	Yes
661	White	Certificate of Discharge under Honorable Conditions (Naval or Naval Reserve)	Yes
662	Yellow	Dishonorable Discharge (Naval or Naval Reserve)	No
MARINES:			
257	White	Honorable Discharge	Yes
257a	White	Honorable Discharge	Yes
258	White	Honorable Discharge	Yes
258a	White	Honorable Discharge	Yes
385a	White	Discharge	No
385c	White	By reason of Desertion	No
385	Yellow	Bad-Conduct Discharge	No
385b	Yellow	Dishonorable	No
COAST GUARD:			
2510	White	Honorable	Yes
2510A	White	Under Honorable Conditions	Yes
2510B	Yellow	Dishonorable	No

NOTE: WACS, WAVES, SPARS, Women's Reserve Corps of the Marine Corps receive same discharge as male personnel.

depend upon their own good intentions toward veterans but should canvass all possibilities inherent in a waiver even though veterans be agreeable at time of signing. This waiver feature of the Act, it should be remembered, is optional insofar as the two parties can get together. The waiver is designed for those instances where both parties may serve self interest in its use.

18,000-TON DIE-FORGING PRESS

The War Production Board has announced the construction of an 18,000 ton die forging press, the largest ever to be installed in this country. Previously there has been no die-forging press over 10,000 tons capacity. The new 18,000-ton die-forging press will contribute to the development of larger and more efficient aircraft components and other military equipment where larger forgings are required.

Spokesmen for the WPB who sponsored the development of the forging press, estimated the cost at $3,500,000. While intended primarily for the forging of magnesium the press may also be used on aluminum and other metals.

Construction and operation of the new forging plant for the Defense Plant Corporation will be carried on by a subsidiary of the Wyman-Gordon Co. of Worcester, Mass., a veteran of 6 years forging experience. The new plant at capacity will employ between 200 and 300 workers. Production is expected to begin within a year.

The new hydraulic forging press is currently under construction at the Mesta Machine Co., of Pittsburgh, Pa. It is estimated that the press will weigh about 5,000,000 lbs and exert a pressure up to 36,000,000 lbs.

Forging presses of more than 10,000-tons capacity for light metals have existed for a number of years in other countries. The Germans are known to have made magnesium forgings up to five or six feet long which have been used as engine mounts in certain of their aircraft. The new 18,000-ton press will enable us to produce still larger sizes.

INDUSTRIAL PLASTICS

Procedures in Plastics

DESIGN OF MOLDED PLASTICS PARTS

INSERTS - PART 1

By Warren V. Prince

Inserts molded into plastics parts may be made of steel, brass, aluminum, fibre, pre-molded plastics, or of many other rigid materials which can withstand molding pressures and temperatures required. Metal inserts are the most commonly used.

Inserts are used for such purposes as thread strength, guides, pins, rivets, bushings, fastenings, electric contacts, conductors, etc. The design of most inserts makes it practical to utilize fairly inexpensive screw machine products.

There is practically no surface-to-surface bond between plastics and inserts. For example, it is impractical for a metal insert to be held in place by bond alone. The bond would be so weak that the insert could be removed with the fingers. *Inserts should be held in place only by their shape or irregularities in contour.* It is true that occasionally we find evidences to the contrary but the holding power is very poor even at best and is not generally recommended.

Holding Inserts in Plastic

The most widely used means for holding inserts into plastic parts are:

Diamond Knurl (on dia.)
Straight Knurl (on dia.)
Grooved Inserts
Bent Bar
Flat and Punched

Of these the most commonly used is the diamond knurl for cylindrical surfaces. It is a series of 90 degree grooves rolled into the diameter and leaving the grooves running in two directions, crossing one another to form a multitude of diamond shaped patterns on the surface. It is sometimes referred to as a "cross knurl" or "double knurl" and prevents the insert from being pulled out axially as well as preventing rotation.

The plastic material flows into the grooves of the knurl and hardens in that shape to prevent movement. Diamond knurling and straight knurling are both very inexpensive operations in the production of inserts.

The most important factor in making a knurl for inserts is to *use a very coarse knurl and run deep enough to leave no cylindrical surface remaining (full depth of knurl).* Partial knurling is a very common mistake in the plastics industry and frequent stripping of the insert in the molded piece results.

A straight knurl is a series of grooves running parallel with the axis of the cylindrical insert and the rules of coarseness and depth apply. Their limitation lies in the fact that the straight grooves allow the insert to be pulled out along the axis unless there is an undercut to prevent it. However, this type prevents rotation very effectively.

Grooved inserts are those having a groove cut into the surface to allow the plastics material to flow into the groove thus holding the insert from being pulled out. Quite often a straight knurled insert contains a groove to prevent pulling out. This groove or undercut need only be deep enough to cause a *shearing* action when the insert is pulled to the point of breaking out of the body of the plastics material. The alternative to removal by shearing action is removal by distortion of the

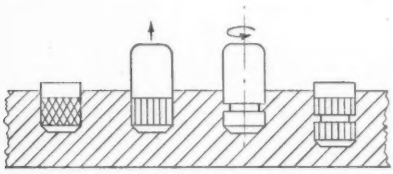


Fig. 1—The common types of knurled and grooved inserts are shown. The diamond knurl prevents rotation and axial movement. The straight knurl prevents rotation but has poor resistance to axial force. Grooved inserts do not prevent rotation. The straight knurl insert with a groove in the middle of the knurled section has good resistance to rotation and good shearing strength.

material and subsequent cracking.

One point frequently overlooked is that shearing takes place very easily with narrow grooves because there is not enough thickness of plastic to withstand the shearing force. This shearing strength is proportional to the width of the groove. Therefore, allow as wide a width of groove as possible without sacrificing other strength requirements. A groove should preferably be located in the middle of the knurled section rather than at one end, if the design of the molded piece makes this practical.

Bent bar or bent rod inserts are very simple and inexpensive and are effective in holding. From the standpoint of molding, bent rod inserts are easily turned or rotated from the flow of stiff material as the cavity is filled. This may or may not be permissible in the molded part depending upon the desired position of the insert. Direction of flow of material must be carefully considered in positioning the insert in this case. The only other bad feature is that the turning will wear the hole larger where the insert is held in the mold and eventually will cause excessive flashing of plastic through the clearance in the hole.

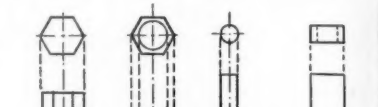


Fig. 2—Hexagonal inserts, straight and grooved, have the same advantages and disadvantages as the straight and straight grooved knurled insert. Bent bar or bent rod inserts are effective in holding but are susceptible to being rotated by the flow of material so that the position of the insert will often determine their practicability. Flat bar inserts resist rotation but must be punched or groove-notched to prevent axial movement.

Flat bar inserts which cannot turn either during molding or in the molded piece after molding must have a means to prevent pulling out after molding. Holes punched in them which fill up with plastic during molding or grooves punched into the sides are very effective.

Plating of Inserts

Inserts are often plated with chromium, nickel, cadmium, copper, etc., for better appearance, rust proofing or better wear resistance without affecting their moldability in any way. Steel inserts, for example, if cadmium plated, will be made rust proof and corrosion resistant; they will wear steel molds less than the same inserts without plating.

Of the four types mentioned cadmium plating is the simplest, cheapest, and coats the part more completely than the

other types. Chromium plating is to the other extreme throughout and produces a very hard surface of approximately 70 to 75 Rockwell C.

Problems with Slender Inserts

When long slender inserts are to be molded into plastics they are easily bent over, broken or sheared off, or dislodged by the flow of the stiff plastics material as it attempts to flow around the insert during molding.

Compression molding places very great forces on inserts. The first thing to consider is the fact that the mold closes on a hard powdered or preformed material, crushing the material down compactly and under tremendous forces. When this compressed material is heated to its softening point, it can flow and relieve such strains. Most inserts cannot withstand normal compression forces required with hard powder or preformed materials.

High frequency heating of materials prior to molding vastly improves this condition because the preformed material is *softened* by heating before it goes into the cavity.

The best position for an insert when compression molding, is on the bottom or top of the cavity with provisions to prevent shifting. In that way the insert is backed up by the mold during closing and the only possible damage would be from crushing of the insert which is not likely under normal conditions.

As the mold closes the semi-hard material moves or flows to fill out the cavity and if inserts are in the path of flow they must be held very rigidly. A long insert should be supported on one end to hold it in place.

Injection and Transfer Molding

For molding around slender inserts it is better to use either injection or transfer molding. In both these processes the plastics material is softened *before* it enters the cavity and enters through a small hole, which is the sprue or gate, into the cavity as a threadlike filament which winds its way about the cavity area during injection until the cavity is filled. Pressure does not build up in the cavity until the material has nearly filled the cavity and at that time it builds up gradually and uniformly throughout the cavity, complying rather closely to the laws of hydraulics. Thus the pressure is applied in *all* directions upon the insert and does not exert a lateral thrust or sideward strain. If the gate is large there will be a greater tendency to bend or dislodge the insert because of the size of the stiff material stream pushing against the insert as the mold cavity fills.

Wall Thickness Around Inserts

Due to the fact that plastics materials shrink an average of 3 to 10 times as much as metal inserts, it is necessary to allow sufficient wall thickness of the plastic around the molded insert to prevent cracking during cooling. Acetates shrink 3 times as much as steel and phenolics shrink 8 times as much. Thin walls of plastics around a metal insert will cool and contract around the circumferance more rapidly and a greater amount than the metal inserts, causing the plastics material to pull apart and crack.

A thicker wall section improves the situation in two ways. It slows down the rate of cooling due partly to greater thickness and partly to the poor heat conductivity from the insert. It allows a slight relieving of strain caused by

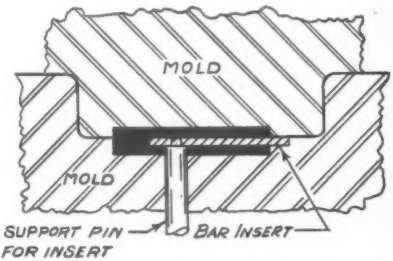


Fig. 3—A long, relatively slender bar insert is held in position in the mold cavity by a support pin. The size of the mold cavity, the force developed by the flow of the material, the tolerances to be held and practical locations available for a support pin are among the factors the mold designer must consider. This type of insert would much more likely be injection or transfer molded.

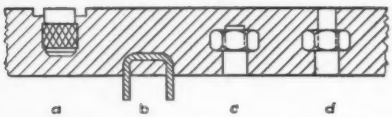


Fig. 4—The diamond knurl insert with a chamfer and provided with a recess is normally good design. A flat special shape, for example a spring, that must project from the plastics material must be positioned carefully to prevent shifting or distortion. Two methods of molding in a nut are shown. The through hole is more general practice. The inserts are held by a shoulder pin.

contraction from cooling by reason of the fact that the inner portion retains its softness as the outer portion contracts upon it.

The following examples may be taken as generally recommended minimum wall thicknesses for thermosetting materials:

¼" and smaller diameter inserts require wall thicknesses of 50 percent of diameter.
¼" to ⅜" inserts require thicknesses of 35% of dia.
⅜" to ⅝" inserts require thicknesses of 25% of dia.
⅝" to 1" inserts require thicknesses of 18% of dia.
1" to 3" inserts require thicknesses of 15% of dia.

Thermoplastics can be molded at about 25 percent less wall thickness than thermosettings. From the standpoint of cracking the same rules apply where an insert comes near the wall of a molded piece. A wall is no stronger than its thinnest section.

Avoid sharp corners on inserts. They very frequently cause cracking of the plastic during contraction from cooling. Even hexagonal inserts require thicker than average walls for this reason.

Length Control

If the distance that an insert projects from the molded piece must be held closely, the insert should be designed with a shoulder or stopping point where it can bear against the mold during molding. Molding pressure will hold it firmly against the mold. It is usually preferable to shoulder against the cavity wall so that if any flashing should occur the flash will be removed with the molded piece after molding instead of building up at an undesired spot which could cause a loss of length of control. The same applies to dirt or foreign particles. Dirt has a tendency to accumulate in the bottom of a hole in a mold when locating is done from the end of a shaft.

It is good practice when the insert must be located positively, or within close limits, to provide a broad chamfer on the end of the insert which projects into the plastics wall or body. The initial flow of the material will drive and hold the insert into position and against the shoulder before the material has a chance to get under the shoulder during the final phase of the filling of the cavity.

Locating can be accurately done from the bottom of a hole in the wall but flash and dirt must be kept out at all times. A blast from an air hose is sometimes not enough to remove foreign matter.

Holding Inserts in place

Inserts to be molded in accurately are placed in the mold cavity with provisions for holding them in position during molding. Inserts are often put into recesses in the mold at the parting line, or in recesses or holes in the cavity walls. In other cases inserts are placed on pins projecting from the cavity wall to hold them in place.

Inserts that do not require accurate positioning and must be held away from the molded surface are held in place either by suspension in preforms or powder or are wrapped with resin impregnated sheet material. Weights and electrical conductors, respectively, are examples of such procedures.

Because of the manual operations involved, all inserts slow down the molding cycle and increase the cost of production.

Holding With Recess

There are two advantages to the recess method of holding inserts in place. This is especially true of the circular recess used in a mold wall. First, the recess provides a means for holding the insert tightly in place in the mold. The insert is tapped into the recess by a light blow with a soft metal bar or small hammer. Similarly, inserts can be snugly held to the top portion of a mold by this method. Secondly, the snug fit in the recess seals off the insert against flashing during molding. This is of particular advantage in keeping flash away

from threads in inserts. When recesses are used the inserts will project from the molded part.

Never use an insert without a shoulder or other stopping or blocking off means in a long or deep hole as the molding pressure will push the insert completely into the hole. Inserts, in such positions, must be supported at the bottom of the hole.

Inserts that go into a hole in the mold and are supported by the bottom of the hole are often upset slightly by the molding pressures resulting in expansion of the inserts, causing them to stick in the hole. This makes the molded piece difficult to eject which in turn may cause warping or it may even cause the insert to pull out of the plastic during ejection and remain in the mold.

Tool Marks Cause Sticking

Most sticking troubles of inserts are caused by annular tool marks in the hole of the mold. The tool marks retard the ejection of the expanded insert. This can be remedied by polishing the hole sufficiently in the direction of withdrawal to remove all annular tool marks. Annular polish marks will also cause trouble if the hole is polished too much in certain places.

Inserts that fit into recesses should be slightly chamfered to at least .010 x 45° for easy entrance. A $\frac{1}{64}$" chamfer is better. The chamfer never need to exceed $\frac{1}{32}$" except under unusual conditions.

The amount of cylindrical depth for the sealing surface of an insert as it fits into the recess of the mold should be approximately $\frac{1}{32}$" and rarely needs to be greater than $\frac{1}{16}$". Do not count the depth of chamfer as part of their cylindrical depth of fit.

If a hexagonal portion of an insert is to protrude from the molded plastic part a hexagonal hole is required in the mold. Hexagonal holes are hard to produce in a mold and afford poor sealing around the insert at best, especially as the mold wears. Hexagonal inserts can, however, be satisfactorily molded on the parting line of the mold if it lies between the two halves of the mold with the parting line at the corners of the hexagon. Means must be provided to hold it in place until the mold is closed.

Square or other odd shaped inserts protruding from the molded part present even greater difficulty. Holes are most easily produced with rotary tools. If odd shapes are required hand filing must be done which involves much time and careful work.

Whenever possible, odd shaped ends should be turned down to round on the portions protruding from the molded part.

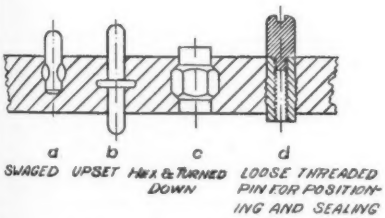


Fig. 5—Swaged or upset rod inserts may extend from one or both surfaces as shown. The rods, being machined to a finished diameter, present definite assembly advantages. A hex insert has been turned down to the round to avoid a hex hole in the mold. The loose threaded pin seals the through hole against molded material and positions the insert in the mold.

Holding With Pins

Inserts having female portions can often be more advantageously held in position with a pin. If the insert must be held to the top of the mold against gravity, a tapered pin should be used and the insert pressed or tapped onto the pin. The taper should be slight and only at a small portion of the pin.

Care must be taken not to use pins that are too small in diameter to withstand molding forces and pressures. Pins that are too long create somewhat the same problems except that the insert tends to tip on the pin and bend it over or break it.

Do not make a pin small in proportion to an insert or it will break off because the projected area of the side of the insert exposed to the flow of material would be far greater than that of the pin and the slender pin could not withstand the force of the stiff flowing material against the insert. In other

(TO PAGE 138—PLEASE)

Win a War Bond !

A CONTEST ON MOLD ESTIMATING

For the best estimate of the Six Cavity Stripper Plate Injection Mold—shown below utilizing the method of estimating given in Mr. Thayer's series of articles "Estimating Plastics Molds" (TDJ Aug., Sept., Oct., Nov. and Dec. 1944 issues) submitted on or before March 1, 1945 we will pay one $25.00 War Bond. Second prize $10.00 in War Stamps, third prize $5.00. In case of tie, duplicate awards will be made. The decision of the editor will be final in each case.

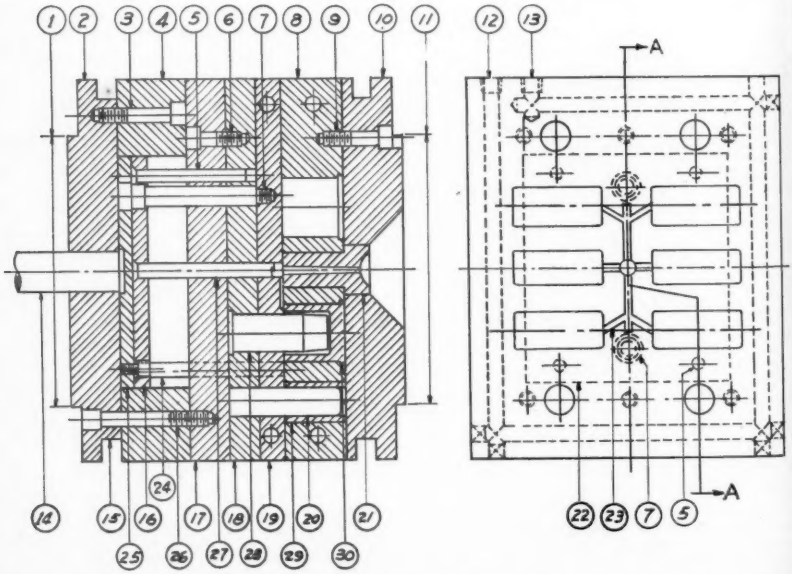


Fig. 1—Two views of the box cover mold—one facing the ejection half, the other a sectional elevation. The compact six cavity stripper-plate design is adapted to short cycle high production runs.

BILL OF MATERIALS

Detail Number	Part Name	Stock Size	Material	Number Required
30	Cavity Block	1¾" x 2¾" x 1½" long	Alloy Mold Steel Hardened	6
28	Core Block	1" x 2¼" x 3" long	Alloy Mold Steel Hardened	6
8	Cavity Retainer Plate	1½" x 10" x 12" long	C.R.S.	1
18	Core Retainer Plate	1¼" x 10" x 12" long	C.R.S.	1
10	Cavity Backing Plate	2" x 10" x 12" long	C.R.S.	1
17	Core Backing Plate	2" x 10" x 12" long	C.R.S.	1
19	Stripper Plate	¾" x 10" x 12" long	Alloy Mold Steel Hardened	1
4	Ejector Box Spacer	2" x 2" x 10" long	C.R.S.	2
2	Rear Adaptor Plate	1½" x 10" x 12" long	C.R.S.	1
16	Ejector Pin Ret. Plate	½" x 8" x 10" long	C.R.S.	1
25	Ejector Pin Assm. Plate	¾" x 8" x 10" long	C.R.S.	1
27	Sprue Eject. Pin	⅜" dia. x 6" long	Drill Rod	1
5	Ejector Pin	⅜" dia. x 6" long	Drill Rod	4
24	Return Pin	⅜" dia. x 6" long	Drill Rod	4
1	Ejector Rod	1" dia. x 8" long	C.R.S.	1
20	Guide Pin	1" dia. x 3½" long	Tool Steel Hardened	4
29	Guide Pin Bushing	1¼" dia. x 1½" long	Tool Steel Hardened	4
21	Sprue Bushing	1½" dia. x 2¼" long	Tool Steel Hardened	1
7	Stripper Bolt	½" dia. x ⅜" Thread		4
9	Assm. Screw	¼" dia.		6
6	Assm. Screw	½" dia.		4
3	Assm. Screw	½" dia.		4

Fig. 2

How to proceed—study the mold drawings, the detail of the molded piece—the cover of the cigarette box—and the bill of materials. Then follow the plan of estimating mold costs by using the Tables of Time Values. You may use your own Table Value index figures, as long as the method is employed. Be sure to include your safety factors. Send all computed data with your estimate on your own shop estimate sheet or a form similar to Mr. Thayer's.

While this mold as shown proved to be efficient in operation, contestants may vary design details if they wish. Reasons given for such changes, if made, will be considered in selecting the winning estimates.

At least two winning estimates will be published in an early issue. Every contestant will receive a copy of a reprint of "Estimating Plastics Molds".

The bill of materials for the six cavity stripper-plate injection mold, Fig. 2, lists all parts and specifies materials and sizes for estimating purposes. Two views of the mold are shown in Fig. 1. Side and end elevation views of the cigarette box are shown in Fig. 3.

Send all estimates to Estimating Contest Editor, Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio. No entries received after Feb. 15, 1945 will be considered for prizes.

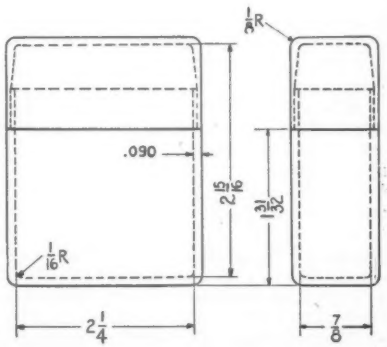


Fig. 3—The side and end elevation views of the cigarette box are shown. The cover part of the box is the part molded.

MOLDS AND THEIR RELATION TO THE FUNCTION OF MOLDING MATERIALS

by Carl H. Whitlock*
DETROIT BRANCH MANAGER
Monsanto Chemical Company
Plastics Division

"... the success of any molding application is 90 percent molds and tools and 10 percent material and experience in molding technique...the achievements of the past three years are due to the combination of the knowledge and experience of the material supplier, the equipment manufacturer, the molder and the mold designer ... the molder did a marvelous job ... but the mold designer really should be given the credit for the greater share of the success."

The technique of design of molds for plastics has progressed in the last several years particularly in that the molding characteristics of compounds have come to influence the design. This is a distinct advance since only a very few years ago the only factors in molding compounds considered by the mold designers were the type and the bulk factor of the material. Molds were produced for the sole purpose of molding a part to a desired shape to within reasonable tolerances and in a design which satisfied the customer. In such a mold the material which had been selected invariably would not work. The material supplier then had to tailor a material that would work.

Fortunately, that period of the plastics industry is about over. Recently we discarded many material formulations as obsolete, formulations which in a number of cases had been sold to one molder for one job. I dare say other material suppliers have done the same thing in the past few years.

Both development in molding techniques and improvements in molding materials have influenced mold design. Molding technique has changed, principally to include the wider use of semi-automatic and automatic molds, transfer molding, the jet molding process and the use of high frequency preheating of molding materials. These changes in molding technique have actuated changes in material formulation necessary to give faster setting materials, different flow characteristics for both compression and transfer molding materials and a new series of materials suitable for jet molding.

Of course, we still run upon jobs which require special materials. Such jobs frequently confront the inexperienced molder who tries to salvage molds made by inexperienced mold builders or who finds that everything goes wrong, no matter how the design or the mold construction was handled. We always have this problem of inexperience, both on the part of the molder and the mold builder. This problem will gradually improve with the general level of experience but it will never be entirely eliminated.

"90 Per Cent Molds and Tools"

I have made the statement on several occasions and I am saying again that the success of any molding application is 90 percent molds and tools and 10 percent material and experience in

*Delivered before the Cleveland Section of the Society of Plastic Engineers, Cleveland Club, September 29th.

molding technique. You cannot mold a satisfactory part with a badly designed mold. You cannot remove a molded piece from a mold without adequate tools or fixtures. The difficulties encountered by reason of poor mold design or inadequate ejection devices have been only too common. A large percentage of culls which find their way to the scrap barrel have gone there because of inadequate knockout arrangements and fixtures which are just as necessary to a successful molding job as the mold itself.

We have learned plenty during the past three years. I say this without too much pride because we learned in spite of ourselves. Three years ago we had not become too well acquainted with specifications. I do not include the material supplier's data sheets, which, while they were intended to serve as rough or approximate specifications and were offered in good faith, were inadequate for the problems which have been put before the molders because of the variations in test procedure. Data sheets tended to gloss over gaps in information, gaps that far too many molders had to fill by trial-and-error experimenting, a costly process in a production shop.

Remember how all of us complained about the specifications of governmental agencies on their war materials? And how often you and I said that this or that could not be done. However, much to our surprise, it was done. It had to be done. What brought about the success of our efforts in war production? It was the combination of the knowledge and experience of the material supplier, the equipment manufacturer, the molder and the mold designer.

The material supplier produced materials which were within the given specifications. The molder did a marvelous job of the "impossible" but the mold designer really should be given the credit for the greater share of the success. I say this because the material supplier had his hands tied when it came to tailoring materials to fit the individual job. Materials were designed to meet definite specifications. Once approved, there could be no variation in this formulation and still stay within the approved sample. Due to the quantity of parts required, several molders were given contracts and each had their ideas on how the mold was to be designed. There was a certain amount of exchange of ideas but not as much as there should have been. The result was the material supplier had only one material to offer each molder and he had to make this material work. Few of us realize what a great accomplishment this was for the molder —but, the molder will have to give the credit to his tool designers and mold builders.

Through more manufacturing control materials for compression molding now have greater uniformity. The changes have resulted in improved production cycles. In general, materials for transfer molding have not been especially formulated. Standard materials have usually been used, but in the softer flows. It is necessary to select materials for transfer molding that have a fairly slow and gradual polymerization cycle. Such materials are included in the general run of formulations. In the case of jet molding, standard materials cannot be used with any degree of success. Most molders have found it necessary to add some type of lubrication to make the material flow through the nozzle. Experiments have been conducted and materials formulated which meet the requirements of jet molding.

In addition to improved molding materials for semi-automatic and fully automatic mold operation, we have had a tremendous increase in demand for the high impact materials brought about by the need for greater strength in war applications.

High Impact Materials Influence Mold Design

The increased use of high impact materials necessitated changes in mold design. There was the problem of finishing the molded part to remove the flash at the parting line of the mold. In compression molding the problem was avoided to some extent by increased molding pressures which tended to minimize the flash. This increase in molding pressure required, in turn, a more careful selection of the mold steels to support the greater pressure. It also involved a more detailed study of the molded product in relation to its mold, particularly in such details as

sections of the mold, location of inserts, size and length of pins—such fixtures which might give trouble when the flow of the molding compound is backed up by increased pressure.

The problem of proper distribution of heat in the mold has become more important during the last few years. In speeding up molding cycles, cold spots are very apt to result. To eliminate this difficulty, we had to give further study to the transfer of heat within the mold. Steam channels or other heating facilities had to be placed where they would keep a continuous uniform flow of heat to the cavity walls. We even had to go so far as to devise intricate heating channels in force plugs. All of these improvements have been developed through trial and error and we have profited greatly by them.

As far as thermoplastics are concerned, we confess that very little has been done to improve materials. It has not been because the material supplier has not been willing to improve his product. The demands of war have absorbed most of the plasticizers used in the manufacture of thermoplastic molding compounds. Substitute plasticizers have been used but results obtained with them are a far cry from results obtained by some of the absent and more recently developed plasticizers.

In spite of the restrictions placed on the use of the thermoplastics, we have not been idle on improvements in molding technique for injection molding. During the past three years more intricate and complete molds have been conceived and put into operation, than in all the years previously since the introduction of injection molding. Without a doubt, the knowledge obtained through these super molds will have a great effect on the entire industry when we get the green light. We hope that the material suppliers will be able to keep pace with the injection molders.

Radio Frequency Preheating

You have heard a great deal about the use of radio frequency preheating of molding compounds. This new development unquestionably has many advantages over the conventional methods of preheating. But as we have learned more about it through actual use of the method, we are discovering facts which may dampen our enthusiasm for this new development. Having had no contact with this development, I do not feel qualified to discuss the pros and cons of the subject, but there is quite an obvious problem in the use of radio frequency preheating which was not given too much consideration at the time of its introduction. This is the fact that the cost is excessive on the basis of the benefits derived. At present the number of applications is limited. However, the full possibilities still remain to be solved. Much will be learned in the next few years on its application and until then, we cannot say that it is or is not what the plastics industry has been looking for.

It is the intention and goal of the material supplier to give the molder better materials; new materials which will improve his product and to cooperate in giving the molder every assistance in his business.

The industry will go through a very competitive period directly after the war, both from within and without the industry. A great deal has been said about the competition of aluminum and magnesium with plastics. We should not look upon these materials as directly competitive—each material should find its specific applications and in many instances each should complement the other. We should work *with* this so-called threat and not *against* it. There will be so many new uses for plastics that it will tax the ingenuity of the industry to keep abreast with it—all of which is a very healthy condition and one to look forward to with pleasure.

In the discussion following this paper the following facts were presented: styrene is coming in rapidly as a mold material and more molds will have to be designed to mold it efficiently; mold designs are tending to become heavier to take higher pressures and provide adequate safety margins; more attention is being given to accurate sizing and positioning of steam lines to provide uniform temperature through the mold body; and that preformed impact materials are gaining in favor. An estimate was made that the preformed materials would ultimately reach 25 percent of molding production.

NEW ADHESIVE UTILIZED AS TOOLING MATERIAL

Thomas A. Dickinson

A new adhesive, developed principally for bonding metals, but which has proven useful for bonding natural and synthetic fabrics, woods, rubbers, Fiberglas and a number of plastics, is in production use at Consolidated Vultee Aircraft Corporation at San Diego, California. Known as Metlbond because of its first successful application, it has been used to bond aluminum alloys, magnesium, cadmium, zinc and steel.

The adhesive is available in liquid, paste and tape forms; it may be applied by spraying, brushing, spreading, or taping. Specific types of the material that are now available include:

(1) The original high-pressure, high-temperature single phase, synthetic-rubber-base type which requires 100 psi curing pressure at 330° F for 20 minutes. This type is sprayed on the parts that are to be bonded.

(2) A low-pressure, high-temperature, two phase type which requires 15 psi curing pressure at 330° F for 20 minutes. A synthetic rubber component of this type is sprayed while a plastic component is brushed onto the parts to be bonded.

(3) A very low-pressure, high-temperature type which requires a minimum curing pressure of 1 psi at a temperature of 330° F. The shear strength of this type is approximately ⅔ that of the first two types.

(4) A tape type which requires a 250° F curing temperature at 100 psi pressure. This type is generally used for bonding parts containing certain organics which become unstable at temperatures above 250° F.

(5) A tape type which requires a 330° F curing temperature at 100 psi pressure. This type has higher shear strength and better heat resistance than the other type of tape.

The procedure followed in utilizing Metlbond depends largely upon the nature of the materials to be bonded. For example, the bond between synthetic rubber Metlbonds and glass fails when subjected to prolonged sunlight; therefore, the plastic type of Metlbond is used next to glass. On the other hand, the adhesion of synthetic rubber Metlbonds to transparent thermosetting materials seems to be unaffected by sunlight.

While Metlbond will produce a joint with a shear strength of 3000 psi, which

This bulkhead subassembly has been bonded by the new adhesive. The joints produced have approximately twice the shear strength of the average riveted joint. The adhesive eliminates brittle joints which are subject to undesirable stress concentrations, low impact or peel resistances and a tendency to crack at low temperatures.

The single phase type and the synthetic rubber component of the two phase type are applied by spraying to parts that are to be bonded.

is about twice the shear strength of the average riveted joint, its high strength is secondary to other characteristics. For example, there are several other adhesives which will form joints with shear strengths in excess of 6000 psi.

The primary advantage of Metlbond is that it does not cause the brittleness that characterizes joints formed with other high-strength adhesives. Brittle joints are not suitable for aircraft installations because they are subject to undesirable stress concentrations, low impact or peel resistances, and a tendency to crack at low temperatures.

Metlbond has impact and peel resistances that are essentially constant at temperatures ranging from —70° to + 160° F. Its peel or stripping resistance is not quite as good as that of rivets, but excellent results can be attained when thin sheets are bonded together if the joint is tack-riveted at each end.

The parts to be Metlbonded are first thoroughly cleaned, then they are sprayed or otherwise covered with a coating of the adhesive. When the cement has dried, the parts are assembled and placed in the hydropress for curing with heat and pressure. The hydropress is equipped with a Dow Therm heating unit which circulates a liquid with a boiling temperature of 350° F eliminating the high pressures involved in using steam. The heated liquid is piped to the top platen of the hydropress and circulated by an electrically driven pump. Adaptor plates make it possible to heat the variety of tools necessary for bonding different kinds of assemblies on the upper platen only. The lower platen is not heated because this might possibly cause partial curing of assemblies before pressure could be applied. Fiberglas pads under the lower tool serve as heat insulators and pressure equalizers.

An example of the use of Metlbond for new applications is the aluminum Fiberglas "sandwich," in which one or more layers of high-strength Fiberglas are bonded between two layers of aluminum. This produces a composite sheet of superior stiffness and tensile strength when compared with aluminum alloys on a weight basis; and, what is even more important, the sheet has unusual sound and vibration deadening properties, which make it particularly valuable for use in aircraft.

When used to bond plastics to aluminum, or aluminum to steel, Metlbond has sufficient flexibility to allow for the differences in the thermal expansion coefficients of the two dissimilar materials. Moreover, the adhesive serves

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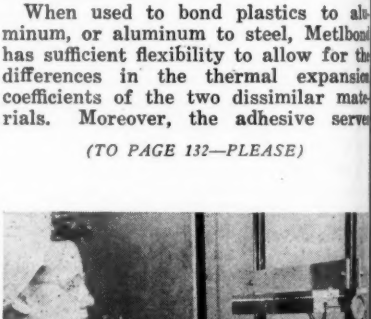


An aluminum Fiberglas "sandwich"— outer layers of aluminum and an inner of one or more layers of Fiberglas— being removed from a laboratory electrically heated press. This type of application is practical for relatively large panel, door and fuselage wall sections

TRENDS IN THE TESTING OF PLASTICS

W. J. Dewar
ASSISTANT TECHNICAL DIRECTOR
Plastics Industries
Technical Institute

During the present period when most of the companies dealing with plastics have the government as their customer, the question of tests and specifications is quite important. Formerly, most manufacturers produced materials with all around good properties that could be adapted to various requirements, and the trend was to accept the published property values and translate them literally to the finished articles. Now, with the increasing variety of uses, the material manufacturers are in approximately the same category as the metals industry where specifications are met by alloys.

Plastics today are becoming specifics, where, by the use of new knowledge of chemistry of the reactions, plus manufacturing improvements, and a great array of plasticizers, fillers, and the like, a plastic can be formulated to meet almost any requirement. With this new found road opening ahead of it, the plastics manufacturer and user alike have realized the shortcomings of the present standard test procedures for evaluating the materials. When the industry, like "Topsy", was just growing, it was satisfied to adopt techniques applicable to other materials such as metals, ceramics, and rubber, as a means of comparing properties. Although the American Society for Testing Materials (A.S.T.M.) methods, which were reviewed in an earlier issue[1] are the accepted standard, the speed with which new materials are being produced has overtaxed the facilities of laboratories and test committees to devise equipment and techniques for standardization.

Recently the government has promulgated a federal specification for plastics—L-P-406a[2]—which supersedes the former L-P-406.

Of a more than fifty tests and specifications, only half are now covered by current A.S.T.M. methods, which, in most instances, are identical. Some of these specifications are more or less duplications in that the Army and Navy sometimes interpret things a bit differently, but in most cases such tests and specifications are new ways of determining life or service expectancy.

Rather than differentiate with respect to rapid or slow action to humidity changes, the materials are now being conditioned preparatory to and during testing by subjecting ⅛" thick articles to 48 hours at 77° ± 2°F (25° ± 1°C) and a relative humidity of 50 ± 2 percent. Thicker specimens are given a 96 hour conditioning period. This is more or less the testing *per se* treatment since the conditions are practically those usually referred to as room condition.

Water usually has a plasticizing action on plastics and since it is encountered in service, should be considered in testing. Regardless of whether the pretreatment is of the *per se* or dessicant method, the main thing is to be certain that both parties concerned are in full agreement as to the conditioning methods and no undesirable variations occur.

With respect to the mechanical tests, the permanence of materials is now being accentuated. Destructive tests that accelerate service conditions are

[1]Warren V. Prince, *Tool and Die Journal*, July, 1944.

[2]For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price: 15 cents.

becoming more popular. Tensile tests are now being supplemented by long time fracture and creep tests usually of 1000 hours duration, where the time required for fracture at different stresses is determined. Under these conditions some materials have long time tensile values only ⅛ of their commonly accepted values. This is an important consideration whenever structural applications are encountered, since too many unsuspecting designers are apt to take tensile properties at their face value with utter disregard for creep and cold flow.

In performing flexural tests, the latest recommendations are for a span length of 16 times the thickness of the specimen so as to minimize the effect of indentation caused by the contact edges of the test jig. This is especially helpful when determining the modulus of elasticity in bending. This method incidentally, is very convenient in determining the modulus and is calculated from the stress-strain curve. The following formula is used:

$$Eb = \frac{L^3}{4bd^3}\left(\frac{P}{Y}\right)$$

where E_b = Modulus of elasticity in bending in psi
L = Span in inches (Should be 16d)
b = Width in inches
d = Thickness in inches
$\frac{P}{Y}$ = Slope of straight line portion of load deflection curve in psi

Most impact tests are now being conducted on the Izod type of machine with a notched specimen. These results are convenient as a means of evaluating materials but the actual impact resistance of the plastic part is quite dependent on the design, method of molding, and temperature. A realization of these points and the fact that a complete break is not always encountered in service, has led to efforts to develop some analogous means of determining shock resistance. The falling ball impact test is a step in this direction. The procedure is to drop a steel ball weighing from ½ to 2 lbs on a freely supported 12 inch square flat sheet ⅛ inch thick. The ball is dropped from successively increasing heights in 1 foot intervals until the fracture occurs.

With regard to the non-mechanical tests, as stated previously, the majority are concerned with the permanence of the material. Optical properties, such as light diffusion, surface stability, internal stresses, and craze resistance, are used for determining the suitability of transparent plastics for aircraft enclosures, lenses and the like.

The accelerated weathering tests are useful in evaluating the comparative life of a plastic part under severe service conditions. The test usually involves alternate periods of high temperature, high humidity, and ultra-violet radiation with one particularly tough specification calling for 24 hours at 100°F and 100 percent relative humidity followed by 4 hours at —70°F and then 16 hours at 160°F and finally 4 hours exposure to ultra-violet radiation. The Navy requires a further modification in which a salt spray alternates with a blast of air at 10-minute intervals under continuous ultra-violet radiation.

These various examples show that the trend in the testing of plastics is more on the practical side with emphasis on the suitability and permanence of a material for a given job. This is only natural now that plastics are being produced as specific formulations for a definite requirement and not so much as type materials that had to be used for a variety of applications.

Precision Fabrication

Precision Fabricated Products are illustrated in a 6-page booklet published by The Sillocks-Miller Company, Dept. TD, South Orange, N. J. The armed forces in all climates use such Sillocks-Miller precision fabricated products as navigational rulers, computers, compass cards, scales, templates, special circular slide rule and protractors because of their moisture and heat resistance. The Sillocks-Miller Company facilities include: cutting, printing, stamping, cementing, milling, turning, blanking, drilling, drawing, forming, laminating, and assembling. Products fabricated of plastics have an advantage over other materials in being more economical, lighter weight with strength and durability, more sanitary, more attractive in finish and appearance, and less expensive in handling and shipping. These products also have a wide range of colors and can be made transparent, translucent, and opaque.

INFORM-A-GRAM KEY No. C62-T

A Plastic Tooling Story

PROCEDURE IN CAST RESIN TOOLING

Plastic tooling at the Fort Worth, Texas, plant of the Consolidated Vultee Aircraft Corporation is doing its part in speeding production on the new Consolidated B-32 Dominator, the bomber which is due to outperform the B-29.

Utilizing Toolite, a phenolic casting resin that is mixed and poured at room temperature, a wide variety of sizes and contours of stretch press punches or dies, master patterns and checking fixtures have been designed, built and used in the Fort Worth shops. The principal advantages of plastic tools have been their low cost and rapid processing, their adaptability to relatively short production runs, the ease of refinishing or repairing worn or damaged surfaces, the fact that they replace critical metals as materials and release time of toolmakers and machine tools for other work.

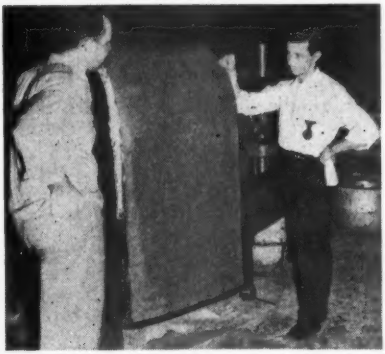


Fig. 1—A. J. Pletcher, foreman, pattern shop (left) and Irving Craig, Jr., general foreman of plastic tooling and pattern shop inspect a 1800-pound plastic hump die.

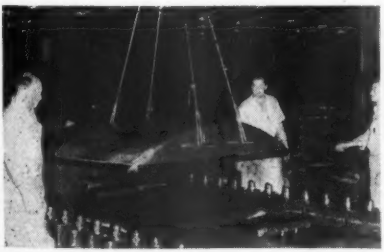


Fig. 2—The light weight of plastic forming dies makes loading or unloading a press a simple, routine affair. Here a large, cored punch is being removed from a stretch press.

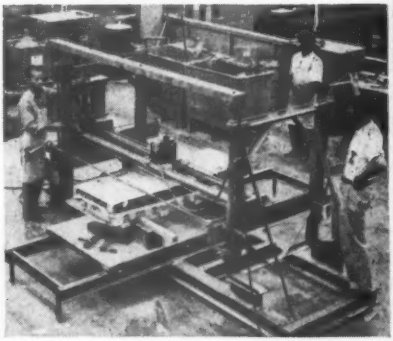


Fig. 3—A specially designed milling machine is shown surfacing a large plastic tool. This operation is performed after the tool has been removed from the oven and while still in its mold.

The success of the program has been due to the fact that coordinated planning and effort have operated from the beginning. Under the encouragement of Charles Marvin, chief tool engineer, proper tool design was worked out and skilled supervision in preparing the molds and mixing the materials was provided by Irving Craig, Jr., general foreman of the Plastic Tooling and Pattern Shop, and A. J. Pletcher, foreman of the Pattern Shop. From a modest beginning during which tools were never larger than one hundred pounds, the Fort Worth shop now casts stretch die punches and checking fixtures weighing from 1,500 to 1,800 pounds.

The process of casting from plaster patterns or molds is relatively simple. A plaster mockup to the tolerances required is made up (template-fillet-faired-in method*). The mockup surface is splined in with plaster and the contours accurately faired. After coating with a parting mixture a reverse plaster cast or female mold, called a "splash," is made. The female mold is then used to make the finished male punch or forming tool. If the plastic tool is to be cored the wooden core or cores, properly moisture proofed, are then suspended in the mold. The mold is then ready for its pre-pouring treatment.

Careful preparation of the surface of the mold is necessary to get successful plastic tools. At Fort Worth the detailed procedure is as follows:

1. After the mold is thoroughly dry, spray with at least two coats of Brolite No. L60 Sealer**.

2. After the last sealer coat is thoroughly dry, spray the mold surface with three coats of Tygon Clear Paint (TP-81)***. Allow at least two hours between sprayings. After the final coat has been sprayed, allow the mold to set overnight.

3. Wax surface of mold thoroughly.

The mold is now ready for pouring.

The liquid casting resin is poured into a mixing bowl. Toolite, used in this case, comes already compounded and requires only the addition of a catalyst. The catalyst or setting agent must be thoroughly mixed with the casting compound. The catalyst is measured out accurately, following the recommendations of the manufacturer. The correct percentage of catalyst is determined by several factors including the maximum tool wall thickness and the permissible acceleration of the curing cycle. At Fort Worth a straight five percent of catalyst is normally used when casting a tool with a wall thickness of three inches or less. This amount may go as low as three percent depending on the wall thickness and the volume of the casting. The catalyst accelerates the curing cycle by creating exothermic heat by chemical reaction. Since the catalyst is a factor in polymerization it will determine whether or not a satisfactory plastic tool will result.

When the casting compound and the catalyst are thoroughly mixed, the mixture is poured into the mold. To assure that the fewest air bubbles are formed, the mix is poured into the lowest part of the mold and allowed to work upward. All air may be eliminated by vacuum pouring, equipment for which is now available.

The cast is allowed to stand at room temperature for 24 hours and then placed in an oven and cured at 160° F (plus or minus 5°) for 16 to 24 hours depending on the size of the cast. If the casting is soft enough to take the imprint of a thumbnail, tested on other than the working surface, when removed from the oven, it must be cured further.

Large plastic tools are regularly cored because it rarely if ever is necessary to go to over 8 inches of material to obtain maximum strength. Coring lightens the weight of the finished tool and cuts down material cost. It also helps eliminate internal stresses due to shrinkage which occurs in all phenolic resins. At Fort Worth it has been found that an addition of three percent of asbestos filler will greatly alleviate such stresses.

*See "Plaster Patterns Simplify Plastic Tooling" P106 August issue. Also available in reprint form as "Plastic Tooling", available from Industrial Plastics Editor, this publication.

**Manufactured by the Andrew Brown Co., Los Angeles, California. Consult your material supplier for other similar parting agents.

***A product of U. S. Stoneware Company, Akron, Ohio.

New Adhesive Tooling Material

(CONTINUED FROM PAGE 128)

as an insulator to prevent electrolytic corrosion between different metals.

Plastic dies, jigs, and fixtures are susceptible to breakage in handling; but at Consolidated Vultee this tendency has been greatly reduced by Metlbonding steel sheets to the more exposed plastic surfaces. Unusually efficient blanking dies have been constructed simply by Metlbonding sheets of tool steel to blocks of Toolite, a cast plastics material.

Metlbond is the result of research and development work by Dr. Glenn G. Havens, H. R. Jenks, and R. D. Ford—all of whom are engineers for Consolidated Vultee at San Diego. Although it remains in an experimental state, the success of the new adhesive has been such that Army-Navy specifications have been altered so as to permit its use in assembling parts for Liberator B-24 and Dominator B-32 bombers.

"Durabonded" By Behr-Manning

Another outstanding improvement in coated abrasives is announced by Behr-Manning, Dept. TD, Troy, N. Y., a division of Norton Company, Worcester, Mass. It is called "Durabonded", a treatment which hardens the adhesive and makes it more resistant to heat and less sensitive to humidity.

Reports on Durabonded products from the metalworking industry shows an average of 20% longer life on fast-running belts, fibre combination discs and the many ingenious cloth "gadgets", all of which are standard tools in this field. There has been no advancement in price on this new product.

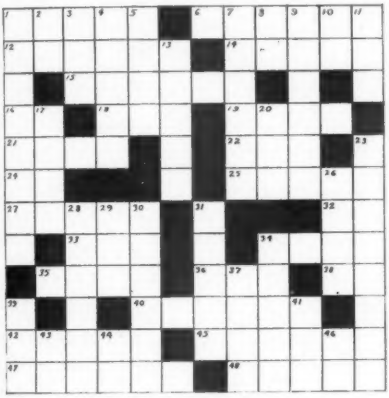
Durabonded products are as great a step forward as were Behr-Manning's two other developments—Openkote, wide separation among the cutting crystals; and Lightning, an electrocoating process which stands the cutting grains on end, equally spaced by means of a powerful electrostatic field.

For additional information regarding the use of Durabonded coated abrasives in metal sanding operations, write direct to the manufacturers, or use the keyed card enclosed in this issue.

INFORM-A-GRAM KEY No. 110-T

Another TDJ Crossword:

(Solution will appear in February TDJ)



HORIZONTAL

1 Substance of great strength and rigidity
6 Smoothed by a tool
12 Indiana manufacturer of electric furnaces
14 Substances which redden litmus
15 A lament
16 Within
18 Suffix meaning "way or path"
19 To march or tramp
21 War vessels belonging to a nation
22 Before
24 Not any (Spanish)
25 Type of grass found in marshes
27 To vote into office
32 In equal degree
33 To fasten
34 Tunes
35 An image of Christ, the Virgin Mary, or a saint
36 Revolutions per minute (Abbr.)
38 You
40 To cause to run off the rails
42 A continued attempt to compel surrender
45 Adorned elaborately
47 To place one thing within another
48 A drunkard

VERTICAL

1 Cleveland designer and builder of precision tooling since 1920
2 Prefix meaning "dawn"
3 The upper end, edge, or surface of an object
4 A metal mixed with a more valuable metal to give it greater strength or some other desirable quality
5 A heavy, pliable and inelastic metallic element
7 Machines in which work is held and rotated while being shaped by a tool
8 Alternating current (Abbr.)
9 Chipped
10 Man's nickname
11 Award for bravery
13 To give way, succumb
17 A slender pointed piece of metal used to fasten wood
20 Wrath
23 Common process for making steel from cast iron
26 Town in Indiana
28 Eats into metal
29 Labor union
30 Easily broken or cut
31 First word in name of corporation which makes alloys
34 Pertaining to or containing the group NH$_2$ united to a radical other than an acid radical
37 One of the portions into which anything is divided
39 Pounds square inch (Abbr.)
41 Extension of one part over another
43 Within
44 General Electric (Abbr.)
46 Musical half-syllable

SHOP MATHEMATICS ON SLIDEFILMS

By Lyne S. Metcalfe

Most of the technologies which are helping to win this war require a basic knowledge of arithmetic, algebra, geometry, and graphing in various phases, and even personnel undergoing training, and who have had mathematics in school or college often find it necessary to "refresh" their knowledge in order to perfect themselves in their new skill. This knowledge is especially important in the tool and die field, and in nearly all mechanical industries today the ability to properly read testing instruments, plot performance and calibration curves, and to use simple trigonometry to determine angular relationships, is of primary importance.

There recently has been made available to the tool and die field a series of 24 discussional type filmslides, totalling 1,087 individual teaching pictures, special photographs, drawings, charts, diagrams and other pictorial exhibits under the general heading, "Light On Mathematics". This series has a triple utility in the machine shop and designing department at a time when a great deal of trained and skillful personnel are being taken by the draft, and when gaps must be filled as promptly as possible, i.e:

(a) As an introductory course
(b) As a "refresher" course
(c) For review

These visual aids, which bring the power and speed of visualization to the aid of the instructor in a foremen's school or apprentice class are integrated with other mediums of instruction including text-books, lectures, shop demonstrations and work projects. The main utility lies in their ability to more rapidly give the student a grounding in mathematics preliminary to the practical application of skills under supervision.

The illustrative material in this series has been made extremely simple, with a free use of pictorial analogy, and a groundwork in the theory of numbers. It has been proved that films of this type (in the how-it-works-how-to-do-it kind of instruction) save as much as 40 per cent of the time other-

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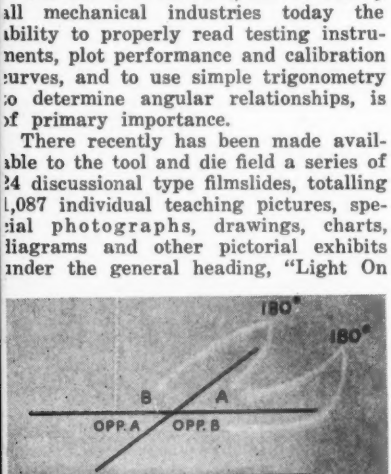

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wise required for the learner to master basic principles.

Briefly the available material is as follows:

ARITHMETIC

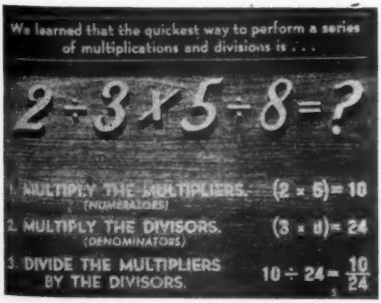
1. Five Keys To Math—46 individual pictures
2. Addition and Substraction—16 pictures
3. Multiplication and Division—27 pictures
4. Fractions, Decimals, and Percentage —55 pictures
5. Addition and Subtraction of Fractions—13 pictures
6. Multiplication and Division of Fractions—21 pictures
7. Square Root and Cube Root—46 pictures
8. Order of Operations—37 pictures

GEOMETRY

1. Addition and Subtraction in Geometry—51 pictures
2. Multiplication and Division in Geometry—48 pictures
3. Angular Measurements—68 pictures
4. Constructions—57 pictures
5. Scales and Models—80 pictures
6. Vectors—52 pictures
7. Trigonometry—35 pictures

ALGEBRA

1. Positive and Negative Numbers—48 pictures
2. Ratio and Proportion—40 pictures
3. Exponents and Logarithms—70 pictures
4. Arithmetic of Algebra—40 pictures
5. Equations and Formulas—53 pictures
6. Problem Analysis—37 pictures


We learned that the quickest way to perform a series of multiplications and divisions is . . .
2÷3×5÷8=?
1. MULTIPLY THE MULTIPLIERS. (NUMERATORS) (2 × 5)= 10
2. MULTIPLY THE DIVISORS. (DENOMINATORS) (3 × 8)= 24
3. DIVIDE THE MULTIPLIERS BY THE DIVISORS. 10 ÷ 24= 10/24

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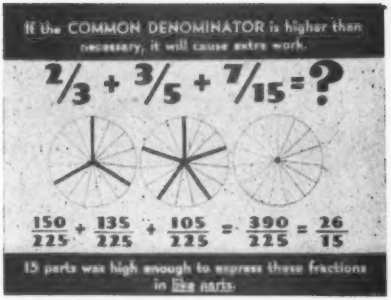
If the COMMON DENOMINATOR is higher than necessary, it will cause extra work.
2/3 + 3/5 + 7/15 = ?
150/225 + 135/225 + 105/225 = 390/225 = 26/15
15 parts was high enough to express these fractions in LESS parts.

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GRAPHS

1. Graph Uses—49 pictures
2. Plotting Graphs—62 pictures
3. Analytic Geometry—36 pictures

The "reading" or discussional type of slidefilm is being widely used for this type of war industry training because of its great flexibility in the hands of the instructor. Each subject is a strip of 35 mm safety motion picture film, with a picture on each frame or sequence, all arranged in logical and proper order to provide progressive "patterns" of ideas, principles and procedures—with letterings, labels, legends and notation superimposed on the film itself and projected with the related pictures.

Generally speaking, teaching procedure is as follows:

1. Introduction of the lesson subject by the instructor with commentary
2. Projection of the film without pause as the instructor reads the letterings aloud and slowly
3. General discussion of what has been seen and heard
4. Second showing of the film with prearranged pauses for elaboration and study of most important sequences
5. Questions and answers
6. Summation by the instructor
7. Exams—to check up individual progress

Text book study may follow along with workshop demonstrations and/or work projects.

This type of film makes it posible, furthermore, for the individual student to privately review any film or any sequence later in order to brush up on his knowledge.

MICHIGAN TOOL COMPANY'S NEW GEAR CUTTING PROCESS

An interesting new method of gear-cutting has been developed by the Michigan Tool Co., Dept. TD, Detroit 12, Mich. Representing a major advance in equipment and process for the production of spur and helical gears, splines, etc., the machine cuts all gear teeth simultaneously with radially fed form-tool blades having a shear-cutting action.

Under development for several years, the new Michigan "Shear-Speed" is capable of rough and semi-finish cutting as many as 60 to 100 or more gears per hour depending on the job. Cutting time on the gear shown in Fig. 2, for instance, is well under one minute.

Michigan Tool Company's objective

Fig. 1—Michigan "Shear-Speed" Model 1843.

in the development of the "Shear-Speed" was to bring the speed of gear cutting up to the level set by modern gear finishing machines. Up to the present time, one gear shaving machine has been capable of handling the output of a considerable number of shapers and hobbers, the actual number differing according to the particular job. With the new "Shear-Speed", production times for rough cutting and finishing can be equalized and predetermined, i.e., one "Shear-Speed" and one shaving machine each, can be counted on to produce continuously a definite quantity of gears per hour or day.

In addition to its vastly higher output rate, the new Michigan "Shear-Speed" uses for the first time balanced cutting pressure around the gear. Only a simple grinding operation is required to bring dull blades back to correct form.

The machine is exceptionally easy to operate and no particular skill is required for its operation. The gear blanks are merely placed on the work holder and the chucking is part of the automatic machine cycle. The operator merely presses a button to start the machine. When the machine has completed its cycle it returns to loading position automatically and releases the finished gear for removal and the loading of another blank. The design eliminates chance of loose arbors and there are no nuts to tighten.

The cutting action of the machine is as follows: When the gear is automatically clamped, the head of the machine, containing the cutter assembly, Fig. 3, automatically lowers into cutting position. It automatically locks in this position. The work now reciprocates vertically. At the beginning of each up-stroke, all blades are advanced radially (fed into the work) an equal amount. On the return stroke, the blades are retracted slightly as on conventional gear shapers in order to provide clearance for the tools. The amount that the blades are fed into the

work on each stroke is adjustable. Correct sizing of the work is also automatically controlled and adjustable.

A "jog" control is also provided on the machine to "inch" it for set-up adjustments when shifting the machine to different jobs.

Adjustments are also provided for the speed of vertical reciprocation and length of stroke. To regrind the blades, or to change over to another type of gear to be cut, the entire inner cutter-

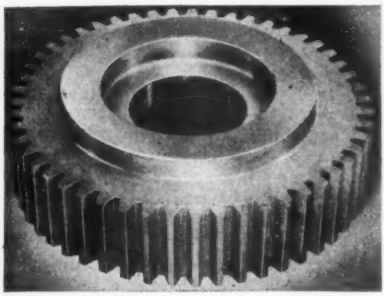


Fig. 2—It takes less than one minute to cut this gear by the new process.

head assembly is removed as a unit, permitting insertion of another cutter head for the resumption of production.

First of the new "Shear-Speed" sizes to be made available by the Michigan Tool Company is their 1843, capable of handling gears up to 4" diameter and 2" face width since these cover the range of most widely needed gears at present.

Shoulder gears, Fig. 4, can easily be handled on the machine, since its action in this respect is similar to that of a shaper cutter. Helical gears as well as spur gears can be cut on the new equipment.

The machine incidentally represents the simplest method yet evolved—regardless of speed—of rough and semi-finish cutting of involute splines.

Among the design and functional features of the machine are its extreme safety of operation and exceptional rigidity. Figure 1 gives an idea of the mass and rigidity of its construction. In addition, deflections are minimized by virture of the fact that cutting loads are completely balanced.

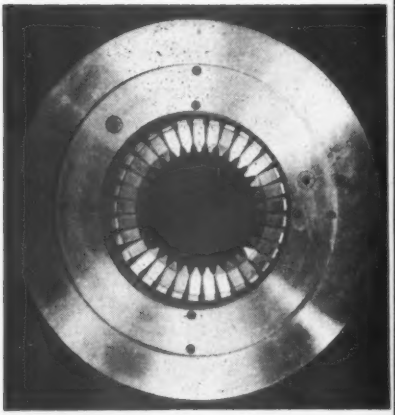


Fig. 3—Cutter head assembly showing 33 individual form-tool blades.

Special provision has been made for rapid chip disposal from the work because of the extremely high rate of metal removal involved.

The cutting fluid supply is located in the base of the machine and is circulated under relatively high pressure to flush the chips away from the work.

Unusual care has been taken to provide accessibility throughout the machine for making adjustments or repairs. All control circuits, hydraulic or electric, are easily accessible. Openings in the machine base and column are of generous size to facilitate any necessary adjustments of the interior mechanism.

INFORM-A-GRAM KEY No. 47-T

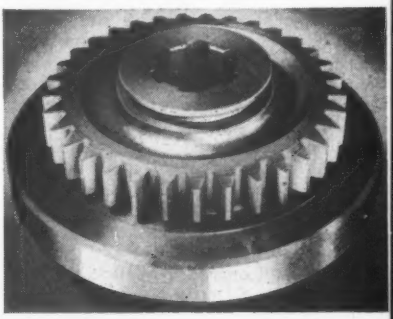


Fig. 4—Shoulder gears such as this present no problems.

Pratt & Whitney's "Tool Shop," a Game

Appearing in the current Pratt & Whitney publication, "Backgrounds" (Vol. III, No. 2) is a clever and constructive idea, "Tool Shop—A Game of Wits and 'Know How' ". The idea is for the player—that's you—to start from scratch and lay out an ideal tool shop. As you make your choice of equipment and spot it on the floor plan chart you are pitting your ideas against examples and recommendations as outlined in the accompanying text. Provision is made for every feature and function of a true "dream shop", from parking space and landscaping to a combination tool crib and office for the traditional "Bull-of-the-Woods". Although an imaginative game, a few hours devoted to "Tool Shop" by any apprentice, tool shop proprietor or production plant toolroom executive would be found to be both recreational and highly instructive from the standpoint of architecture and construction, machine tool selection and installation, arrangement of aisles, power requirements and storage and shipping facilities. For your copy of "Tool Shop" use our

INFORM-A-GRAM KEY No. 430-T

(CONTINUED FROM PAGE 121)

words, do not design inserts that have to be held with comparatively slender inserts when the flow of material is against the side of the insert.

Small pins for inserts must have a radius or fillet at their base in order to prevent breaking. A sharp inside corner at the bottom or shoulder of a pin would break very easily due to stress concentrations which accumulate in the corner. A straight pin put into a hole is not bad. It is best to use a pin with a shoulder flush with the cavity wall and a fillet at the shoulder for strengthening. When such a radius is used the same stresses are distributed over the radius instead of being concentrated in a sharp corner and the pin is many times stronger.

The effect upon the design of the insert is that a *chamfer* should be used at the thread entrance of the insert in order to clear the radius on the pin which holds it.

Next month Mr. Prince will continue his discussion on inserts.

Apprentice Training Programs

An all time record for apprentice training has been established in the United States with 32,000 industrial establishments officially registered with the Apprentice Training Service of the War Manpower Commissions' Bureau of Apprentice Training Service. Organized apprentice programs are being entered into at a record breaking pace. Many of the new apprenticeship agreements are applicable to trades and industries in which apprenticeship program standards have already been set.

The metal construction and service trades are accounting for a large percentage of the increase in establishment of apprenticeship programs. They cover apprenticeship training programs for single industrial establishments, contractors or service shops and also in some cases training programs for large groups of establishments.

An example of the above is an area-wide agreement entered into by both employers and labor unions in the plumbing trade in the Chicago area. Approximately 700 plumbing shops are covered by the agreement. In all such agreements, responsibility for training is shared by labor and management.

Employers and labor are aware of the need for the revival of training of all-around skilled workers. This is significant not only in relation to the war effort but also in relation to the postwar period.

It has been announced by the ATS that more than 1,000 veterans are all ready enrolled in apprenticeship programs. It is expected that greatly increased numbers of veterans will eventually be enrolled in specific programs. Veterans are frequently given credit for any training related to their apprenticeship received while members of the armed forces.

Numerous requests have been made to the ATS by employers in industries with no established apprenticeship standards for surveys anticipating the setting up of such standards. Requests for such standards have been received from textile employers, refrigerator manufacturers, glass laboratory apparatus manufacturers and other employer groups.

ASTE—Cleveland Exposition Postponed

Indefinite postponement of their Industrial Production Planning Exposition scheduled for the Cleveland Auditorium in March in order to help relieve the domestic transportation crisis has been announced by the AMERICAN SOCIETY OF TOOL ENGINEERS.

In a telegram to James F. Byrnes, Director of War Mobilization, D. D. Burnside, President of the ASTE, revealed that they have also postponed indefinitely the National Technical Sessions which were scheduled to be held simultaneously with the "Tool Engineering Industrial Planning Exposition."

Indefinite postponement of its exposition and national technical meeting, according to Burnside, does not mean suspension of the Society's activities. Rather, plans now call for added emphasis of meetings of a more localized nature in its 66 chapter cities.

The Society announced, at the same time, that its change in program will also involve added emphasis on coverage of the production developments as planned for the Cleveland exposition and technical sessions by the Society's publication, The Tool Engineer.

NTDMA Activities

A January meeting of midwestern tool and die shop owners was held in Milwaukee by the National Tool and Die Manufacturers Association. In addition to regional attendance from Cleveland, Chicago, St. Louis, Des Moines and Minneapolis, a concurrent meeting of the Association's Board of Directors brought owners from all over the country. Speakers were R. F. Moore, president, and George S. Eaton, executive secretary, of the NTDMA.

A presentation was made of the detailed, 26-point program of activities for the NTDMA as approved by the Board.

One of the first by-products of the Association's activities is a publication sponsored jointly by The National Tool and Die Manufacturers Association and the Chicago Tool & Die Institute. Entitled "The Tool and Die Industry Comes of Age" it embodies a study made by W. R. White, Jr., vice president in charge of production of the Midwestern Tool Co., Chicago, and Stuart H. Sinclair, Sales Manager of the Federal Tool Corporation, Chicago, the purpose of which is ". . . to point out some fundamental factors directly influencing the many tool and die shops throughout the country who may find readjustment to peacetime ways difficult."

Based on surveys, questionnaires and case histories from within the industry, the textual and statistical information contained in this publication should be of great assistance to any and all tool and die shop executives in computing excess profit taxes, in seeking relief under the law, in renegotiation, and in industrial relations.

"The Tool and Die Industry Comes of Age" is being mailed free to NTDMA members; to others it will be available at a nominal price. Inquiries should be addressed to: National Tool & Die Manufacturers Association, 1413 Union Commerce Bldg., Cleveland 14, Ohio.

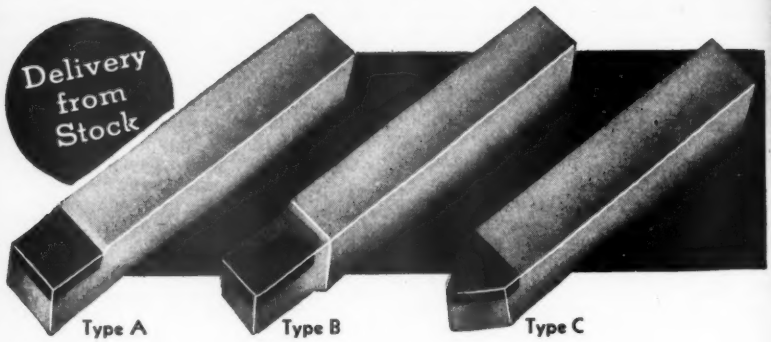
American Society of Lubrication Engineers

Lubrication engineers representing prominent industrial and transportation companies and educators have organized a non-profit body known as the American Society of Lubrication Engineers, with headquarters at 135 South LaSalle St., Chicago 3, Ill.

The new organization states that "lubrication engineers have felt for years the need of a national organization pertaining directly to their profession. Our objective is to put on a sound basis the fundamental precepts of lubrication which we believe will be of benefit to all phases of industry with their many related problems . . . We also believe that the endeavors of our Society can be accomplished without conflict with or injury to existing engineering societies having lubrication sub-divisions."

Officers of the American Society of Lubrication Engineers are: C. E. Pritchard, Republic Steel Co., president; J. C. Peebles, Dean of Engineering, Illinois Institute of Technology, vice-president; B. H. Jennings, Professor of Mechanical Engineering, Northwestern University, secretary and treasurer. Directors include D. N. Evans, Inland Steel Co.; I. L. Harper, Lehigh Valley Railroad; and D. E. Whitehead, Carnegie-Illinois Steel Co.

TUNGSTEN CARBIDE TIPPED BITS



Furnished in 2 Grades of Carbide—Specify Which Wanted:
Grade 1—For Steel Grade 2—For All Other Materials

TYPE A
Square Nose

ORDER No.	SHANK SIZE	NET PRICE
A- 11	1/4 x 1/4 x 2-1/4	$0.70
A- 12	5/16 x 5/16 x 2-1/4	.70
A- 13	3/8 x 3/8 x 2-1/2	.75
A- 14	7/16 x 7/16 x 3	1.10
A- 15	1/2 x 1/2 x 3-1/2	1.10
A- 17	5/8 x 5/8 x 4	1.65
A- 18	3/4 x 3/4 x 4-1/2	2.25
A-106	1 x 1 x 7	3.90

TYPE B
BR—Right Hand Shown
BL—Left Hand Opposite

BR- 41	BL- 71	1/4 x 1/4 x 2-1/4	.70
BR- 42	BL- 72	5/16 x 5/16 x 2-1/4	.70
BR- 43	BL- 73	3/8 x 3/8 x 2-1/2	.75
BR- 44	BL- 74	7/16 x 7/16 x 3	1.10
BR- 45	BL- 75	1/2 x 1/2 x 3-1/2	1.10
BR- 47	BL- 77	5/8 x 5/8 x 4	1.50
BR- 48	BL- 78	3/4 x 3/4 x 4-1/2	1.60
BR-406	BL-706	1 x 1 x 7	3.25

TYPE C
Round Nose

C-121	1/4 x 1/4 x 2-1/4	.80
C-122	5/16 x 5/16 x 2-1/4	.80
C-123	3/8 x 3/8 x 2-1/2	.95
C-124	7/16 x 7/16 x 3	1.20
C-125	1/2 x 1/2 x 3-1/2	1.20
C-127	5/8 x 5/8 x 4	2.10
C-128	3/4 x 3/4 x 4-1/2	3.00

Carbide Tipped Reamers and Carbide Tipped Milling Cutters Carried in Stock

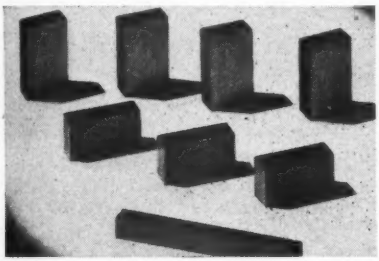
GET IT AT THE BRONX
EST 1908

BRONX HARDWARE & SUPPLY CO., INC.
2731 THIRD AVENUE NEW YORK 51, N. Y.
MACHINE TOOLS, CUTTING TOOLS, FACTORY EQUIPMENT, & ACCESSORIES

PROGRESS ON PARADE

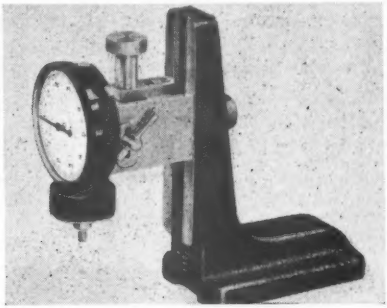
Use our postage-free Inform-a-Gram for your requests.

"HARDSTEEL" TOOL TIPS. A new line of tool tips made of "Hardsteel" and designed for brazing onto steel shanks has been added to the Black Drill Co.'s line of tool bits. Some of the advantages of the "Hardsteel" Tool Bits are that they are more economical in first cost, they are more easily and quickly re-ground on a standard wheel one or two grades softer than is necessary for high speed steel and they are easy to braze. They permit the making of tools that combine a strong tough shank with a cutting edge having the



abrasion resisting qualities of the sintered carbides plus the shock resisting qualities of high speed steel and are ideal for machining the harder and tougher steels and the more abrasive copper and light metal alloys, either rolled or cast. They hold their cutting edges over long periods of use at higher cutting speeds and thus save down time. "Hardsteel" Tool Bits are made in all standard sizes and are available from stock. Special sizes for unusual applications can also be supplied. Write BLACK DRILL CO., Div. of Black Industries, Dept. J, 1400 E. 222nd St., Cleveland 17, O., for detailed information.
INFORM-A-GRAM KEY No. 588-T

NEW NON-MAGNETIC INDICATOR PEDESTAL. The Model "DNF-10" manufactured by Bartelt Engineering Co. is, with the exception of the dial indicator, constructed of hard brass and designed especially for free use in an active magnetic field. This facilitates setting up and checking work which is being held on a magnetic chuck, an operation most difficult with an ordinary height gage or other measuring device because of the strong pull of the magnetic field. The Model "DNF-10" and its steel counterpart, Model "DF-10", are designed for gaging from flat surfaces such as machine tables, surface plates, bed or upright ways, etc. For approximate setting, the indicator carriage block is clamped where desired on the upright. The dial indicator is then adjusted to exact position on the face of the carriage block by a micrometer screw and is then clamped separately. This permits added



fineness of adjustment and the carriage block gives increased clearance from the face of the pedestal upright. The dial of the "DNF-10" is calibrated to read in increments of .0001". Overall height is 8" with a range of approximately 4" from the base surface upward. The pedestal itself is a high quality fine grain casting with the base and vertical surfaces ground to extremely close limits. All surfaces of the gage except those ground or polished are finished in black crackle. Write to BARTELT ENGINEERING CO., 1212-M Partridge Ave., Beloit, Wis.
INFORM-A-GRAM KEY No. 712-T

THE FLASH-O-LENS MAGNIFIERS offered by R. P. Cargille of New York have been incorporated into an assembly known as the

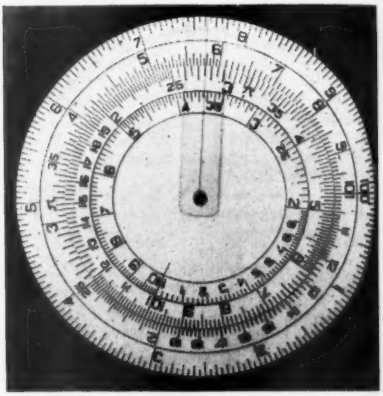
Master Magnifier Set No. 44. This new assembly of wide field magnifiers with built-in illuminating units which are operated by battery and by electric control, contains 7-power, 20-power and 40-power magnifiers. The 40-power model is equipped with a 0.001" scale. The magnifiers have been found useful for inspecting plating for pitting, pin-

holes, texture; for inspecting surface metal for incipient cracks; also for inspecting welds for cracks; for detecting corrosion; for precision measurements on tools and dies, measuring small holes and for critically inspecting finely edged and sharply pointed tools. For more information on Master Magnifier Set No. 44-TDJ, write R. P. CARGILLE, 118 Liberty St., New York 6, N. Y.
INFORM-A-GRAM KEY No. C38-T

NEW ROTARY TABLE. The Index Machine & Tool Co. are now manufacturing a new, high grade, 12" tool room rotary table. This product's features include a ball type main

bearing, quick acting worm throw out, a coolant trough cast in base and a hardened and ground worm. The single motion positive table lock does not disturb the table alignment. Descriptive literature and prices are available through BLANK & BUXTON MACHINERY CO., Dept. J, 3100 E. Michigan Ave., Jackson, Mich.
INFORM-A-GRAM KEY No. 211-T

MONITOR CIRCULAR SLIDE RULE. The improved process of graduating black lines on white vinylite has enabled the Tavella Sales Company to produce a slide rule that is small, light in weight and which will retain its legibility indefinitely. The scales are



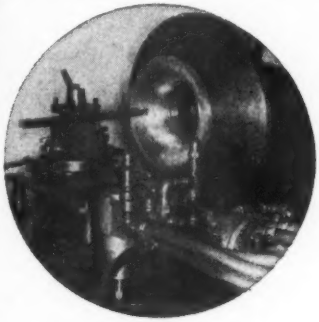
on a disc 6" in diameter; length of multiplication, division scale is 13.8". This Monitor quickly solves problems involving multiplication, division, square root, the use of logarithms and functions of angles. The front side of the Monitor has four scales—Log, C, D and CI or C inverted scale. The reverse side has sine and tangent scales and A and D scale for finding squares and square roots. The TAVELLA SALES CO., Dept. T, 25 West Broadway, New York 7, N. Y., will send more information on request.
INFORM-A-GRAM KEY No. C39-T

ARC TORCH FOR ELECTRIC WELDING. The 9000 Arc Torch which is manufactured by the Mid-States Equipment Co. is designed to provide an electric flame of approximately 9000° F. This heat is free of oxygen or other gas to contaminate the weld and there is no pressure to force molten metal away from or to blow holes in light sections. The new torch can be used with any AC or DC electric welder for welding aluminum and aluminum alloys, brass, bronze, red brass, phosphorous bronze, silicon bronze, nickel silver, cast iron and other copper and non-ferrous metals and alloys. It is also used for brazing steel, cast iron, malleable iron, copper, brass, bronze

and other ferrous and non-ferrous metals; for pre-heating all metals prior to welding; for soldering all ferrous and non-ferrous metals; for straightening and bending; and for hard

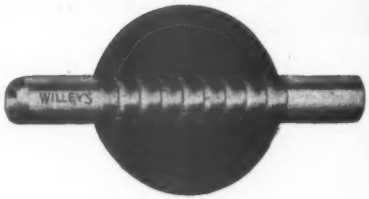
surfacing where wear-resisting metals are used. For complete details write MID-STATES EQUIPMENT CO., Dept. T, 2427 S. Michigan Ave., Chicago 16, Ill.
INFORM-A-GRAM KEY No. 393-T

MACHINING VARIABLE CONTOURS. The Turchan Follower Machine Co. has recently announced a new application of the Turchan Hydraulic Follower Machine whereby a lathe can now be used to machine curved surfaces of variable contours. The illustration shows a circular magnesium housing, approximately 17" in diameter with three different radii and tapers, being machined on a lathe equipped with a Turchan attachment. With the use of a master pattern or template as a guide,



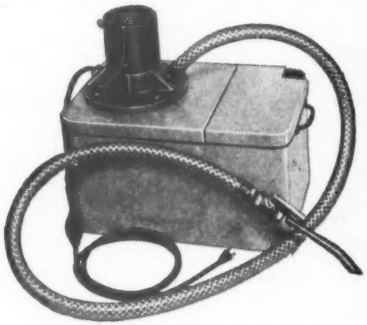
the attachment follows the contour so exactly that the housing is finished to a tolerance of .001" on both the inside and outside diameters. The attachment will make a complete cut every 15 minutes, thereby performing in approximately an hour a machining operation which by former hand methods would require several days. For more information on the Turchan Hydraulic Follower Machine, write TURCHAN FOLLOWER MACHINE CO., Dept. T, 8257 Livernois, Detroit 4, Mich.
INFORM-A-GRAM KEY No. 104.5-T

BROACHES OF SOLID WILLEY'S METAL. One of the specialized applications of Willey's Metal is the manufacturing of solid Tungsten Carbide broaches, as illustrated. These are



now made in diameters of from .250" to 1" and moderate lengths by WILLEY'S CARBIDE TOOL CO., 1340 W. Vernor Highway, Detroit 1, Mich. Write today for more details.
INFORM-A-GRAM KEY No. 551-T

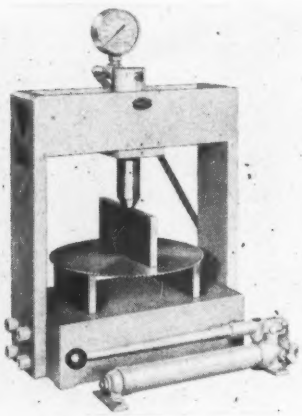
THE PORTABLE TANK COOLANT PUMP recently added to Brady Pump Co.'s line of "Pinch-Hitter" pumps can be carried to any machine and started by merely plugging the electric cord into an ordinary light socket. Capacity of the pump is 300 gph for water and solubles; 250 gph for light oils. The flow of coolant is manually controlled by the operator. Four multiple nozzles may be used on drill presses, etc. The baffled, split-lidded



tank of 16-gauge welded steel is 16" long, 9" high and 10" wide and may be cleaned without disturbing the return piping. The ball bearing, totally enclosed 110 volt, single phase induction motor is drip-proof and dirt-proof and is externally fan-cooled, having a heavily guarded cooling fan on the shaft extension. The extra heavy, one-piece shaft is attached to an open impeller. There is no "whip", no gear and no seal. If prices and additional data are required, write BRADY PUMP CO., Dept. J, Muncie, Ind.
INFORM-A-GRAM KEY No. B31-T

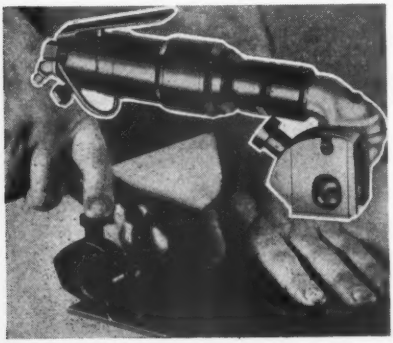
A NEW LABORATORY PRESS with a total capacity of 20 tons or 40,000 lbs. has been added to the Anderson line of presses. This unit has a stroke of 5" and the accurately machined table is 12" x 20". Power is derived from a hydraulic hand pump. In addition to use as a laboratory press, this unit can be

used for many production straightening jobs such as large sprockets, gears, plates, etc. Although the illustration here does not show a table or stand, one can be furnished to suit



the customer's requirements. This press weighs 400 lbs. ANDERSON BROS. MFG. CO., Rockford, Ill., will send full particulars on this new laboratory press on request.
INFORM-A-GRAM KEY No. 190-T

PNEUMATIC "BABY" SAW. First introduced at the 1944 ASM Metals Exposition, the Cleco Pneumatic Baby Saw is enjoying widespread acceptance in industry and particularly in the aircraft field. Manufactured by THE CLEVELAND PNEUMATIC TOOL CO., Dept. D, 3781 East 77th St., Cleveland 5, O., the saw's specifications and performance are presented in their Bulletin No. 95S-TD. Capable of ripping metal sheet up to $\frac{1}{8}$" thick in steel, brass, aluminum, etc., it will make a straight or curved cut in $\frac{1}{8}$" steel at a rate of 1" per

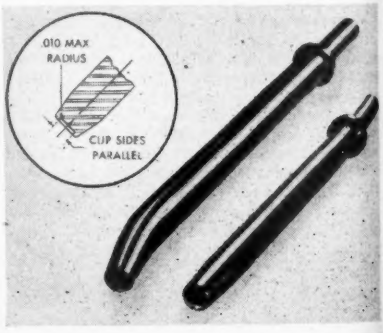


second. The quality of the cut is such that the edges are left free from burrs. The saw blade proper is of special steel, heat-treated specifically for the job. The total weight of the tool is only 2¾ lbs., and its overall length is about 8". Request Bulletin No. 95S-TD from the Cleveland Pneumatic Tool Co., or use our handy
INFORM-A-GRAM KEY No. 239-T

THE GRAHAM SUPER-CUT is a new type rotary file developed by the Graham Rotary File & Tool Co. of New York which combines all the features of both the hand cut and ground product. With this new file, chattering is prevented by the hand under-cut tooth. The forged hammer surface provides additional toughness and the ground edge, perfect symmetry. The fluted tooth prevents clogging.

A new type hardening known as the sub-zero process is used in the manufacture of these files. The Graham Super-Cut can be used on any metal or plastic and will burr the toughest steel alloy. It can run at extremely low or high speeds and be run in any drill press, electric or pneumatic portable tool. Full particulars on this new type rotary file may be obtained from GRAHAM ROTARY FILE & TOOL CO., 387 Fourth Ave., Dept. T, New York, N. Y.
INFORM-A-GRAM KEY No. 11-T

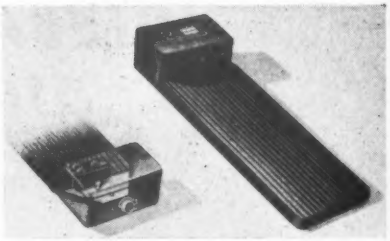
IMPROVED RIVET SETS FOR A N 442 RIVETS. The new rivet sets announced by the



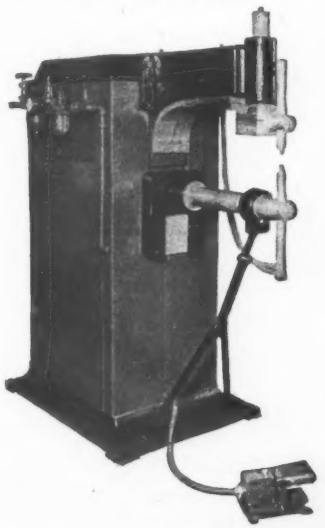
Aero Tool Co. of Burbank, Calif., are made with cups coined for dimensional accuracy, resulting in uniformly parallel cup sides and a cup base radius which is held to .010 maximum. This tool was developed when it was observed that the fit of A N 442 sets cupped by the conventional turning process was so unsatisfactory that many aircraft manufacturers were using flush sets to drive A N 442 rivets. It has been shown that this improvement will not only eliminate the physical hazards and surface damage resulting from a slipping flush set or inaccurately cupped A N 442 set but will speed production and reduce worker fatigue. The original shape and dimensions of the rivet head are accurately preserved. The coined A N 442 cup is available in all standard sizes of both straight and offset rivet sets at no increase over regular catalog prices. For complete information, write AERO TOOL CO., Dept. D, Burbank, Calif., and ask for Catalog Insert-Page No. P-1.
INFORM-A-GRAM KEY No. 174-T

THE NEW ROUND SURFACE PLATE announced by Machine Products Corp. measures 102" in diameter and was designed and built primarily for checking gun turrets. The two-and-a-half ton plate, approximately 18½" in depth, follows the same ribbed construction design characterizing the other surface plates of this manufacturer, even to the 3-point bearing principle employed in the making of the steel fabricated base on which the plate must rest. This plate and the others being added to the company's catalog are cast of Meehanite iron with the entire face precision scraped. Detailed information will be sent on request by MACHINE PRODUCTS CORP., Dept. J, Detroit 12, Mich.
INFORM-A-GRAM KEY No. 144-T

NEW FOOT SWITCH. The Model "MF" recently developed by the General Control Co. of Boston is a new foot switch for actuating one to eight circuits. The foot rest of the "MF" is only ½" above the floor and it requires only ⅛" throw, thus allowing the operator to support his whole foot nearly at floor level and reducing fatigue to a minimum. It is ruggedly constructed to withstand severe use and is splash and dust proof so that factory conditions cannot affect its life or limit its application. Details on the Model "MF" will be sent by GENERAL CONTROL CO., Dept. D, 1204 Soldiers Field Rd., Boston 34, Mass.
INFORM-A-GRAM KEY No. C59-T



REX SPOT WELDERS. The Interstate Machinery Co. of Chicago has announced that Rex Spot Welders are now obtainable in the standard or automatic repeat (Stitch) air operated Rocker Arm or Press type. These are manufactured in 10, 20, 30, 40, 50, 75, 100, 125, 150, 200 and 250 KVA capacities. Foot operated spot welders are available in 2½ KVA to 75 KVA; motor driven type in 10 KVA to 100 KVA. INTERSTATE MACHINERY CO., Dept. T, 1435 W. Pershing Rd., Chicago 9, Ill., distributor of the Rex line, will mail illustrated and descriptive bulletins covering the types listed above if requested.
INFORM-A-GRAM KEY No. C42-T



DIECASTING DIGEST

V—Efficient Injection Is Key to Better, Cheaper Zinc Castings

In the manufacture of zinc die castings, molten metal is delivered from the heated pot to the die, either by air pressure on a closed receptacle or by a hydraulically actuated plunger. In the latter method, the injection system consists of a piston and cylinder to which is attached a gooseneck and nozzle for delivery of hot metal to the die.

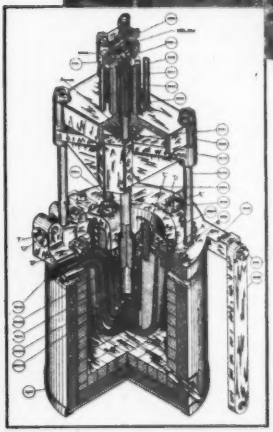
Zinc injection systems usually fail as a result of both corrosive and erosive action of hot metal; pistons and cylinders lose their close fit, metal squirts past the piston, injection pressure is lost, inferior castings result.

The injection system employed by Lester-Phoenix die casting machines for zinc, tin and lead alloys is engineered to eliminate these difficulties and to make strong, dense, smooth-surfaced castings.

Furnace and pot are round, burners are arranged to give tangential flames for maximum heat transfer, low heat loss and less heat fatigue to the machine operator. Pots are made of high-chrome cast iron; cylinder and gooseneck of heat resisting chrome-nickel alloy cast iron; and plunger piston and cylinder sleeve of nitrided nitra-alloys. In the larger models, the plunger piston and cylinder sleeve are made of heat treated high-tungsten steels.

WHAT ABOUT ALUMINUM!

The best aluminum, magnesium and brass die castings are made by "slow-squeeze" injection, described in "Pre-fill Injection System for Die Casting". Write Lester-Phoenix, Inc., 2625 Church Ave., Cleveland 13, Ohio.



Dense, smooth surfaced, easily polished zinc die castings at high production rates—up to 500 or more shots per hour—can be obtained from new modern Lester-Phoenix die casting machines, using the zinc injection system shown at the left. Get full information from—

LESTER-PHOENIX, INC.

2625 Church Ave. Cleveland 13, Ohio

FREE CATALOGS and data on design of die casting are yours for the asking.

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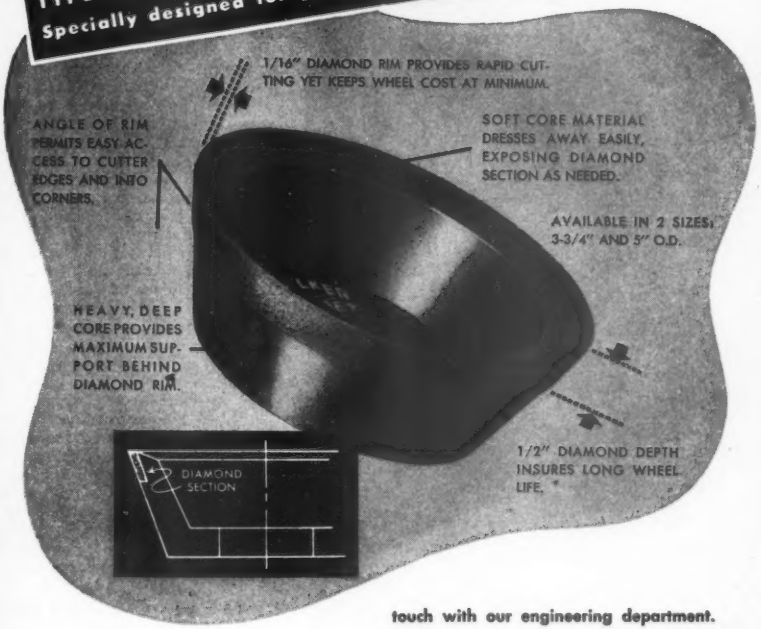
DIE CASTING MACHINES

For highest diamond wheel economy . . . Greatest grinding convenience!

FELKER DI-MET

TYPE D11WT RESINOID BONDED DIAMOND WHEELS

Specially designed for grinding carbide milling cutters


1/16" DIAMOND RIM PROVIDES RAPID CUTTING YET KEEPS WHEEL COST AT MINIMUM.
ANGLE OF RIM PERMITS EASY ACCESS TO CUTTER EDGES AND INTO CORNERS.
SOFT CORE MATERIAL DRESSES AWAY EASILY, EXPOSING DIAMOND SECTION AS NEEDED.
AVAILABLE IN 2 SIZES: 3-3/4" AND 5" O.D.
HEAVY, DEEP CORE PROVIDES MAXIMUM SUPPORT BEHIND DIAMOND RIM.
1/2" DIAMOND DEPTH INSURES LONG WHEEL LIFE.
DIAMOND SECTION

Felker DI-MET Diamond Abrasive Wheels are made in all standard types in both metal and resinoid bonds. Special wheel types are made on order. If you have grinding problems requiring diamond wheels, get in touch with our engineering department. Quick service is assured through our offices and distributors from coast to coast.

Have you received your copy of the Felker DI-MET Catalog featuring metal and resinoid bonded diamond wheels? A postal card will bring it!

FELKER MANUFACTURING COMPANY

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MANUFACTURERS OF FELKER DI-MET DIAMOND ABRASIVE WHEELS

PRECISION

— AS VITAL IN WAR AS IN PEACE

In every theater of war South Bend Lathes are holding to their pre-war traditions for dependable precision. In the mobile machine shops of our mechanized forces they duplicate factory tolerances on intricate parts required for emergency repairs on guns, tanks, trucks and other essential equipment. On board many of the Navy's fighting ships, where high precision is an absolute requirement, they are also depended upon for maintenance and repair of mechanical equipment. In the repair bases of the Air Forces they play an equally important part in keeping planes in service.

In all classes of war service these lathes are doing fine precision work—not only with the armed forces but also in industry where dependable accuracy is as vital as speed and versatility in meeting war's urgent production schedules.

When civilian production is resumed South Bend precision will again prove as indispensable to peace-time industry as it is now for exacting war work. Embodying the improvements developed to meet war production requirements, South Bend Engine Lathes, Toolroom Lathes, and Precision Turret Lathes will be available.

NEW CATALOG

Now Ready — Write For It!

Illustrated in full color—showing all types and sizes of South Bend Lathes. Engine Lathes and Toolroom Lathes with 9", 10", 13", 14½", and 16" swing. Precision Turret Lathes with ½" and 1" collet capacity. Ask for Catalog 100-D.

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Technical Committee—Gray Iron Founders

Walter L. Seelbach of Cleveland, president of the Gray Iron Founders' Society, recently announced the make-up of the association's technical committee for 1944-45. Edward L. Roth, president of Motor Castings Co., Milwaukee, has been renamed chairman and other reappointments include Frank J. Dost, vice president and superintendent of the Sterling Foundry Co., Wellington, Ohio; Dr. R. A. Flinn, metallurgist, American Brake Shoe Co., Rahway, N. J.; W. W. Levi, metallurgist, Lynchburg Foundry Co., Lynchburg, Va.; R. D. Phelps Jr., secretary, Francis & Nygren Foundry Co., Chicago, and Donald J. Reese, the development and research division, International Nickel Co., Inc., New York City. A new member is T. E. Eagan, metallurgist, Cooper-Bessemer Corp., Grove City, Pa. Ex-officio members are A. J. Edgar, technical adviser of the society, and W. O. McMahon, Birmingham, southern area technical consultant.

Drawing Steel Cartridge Cases

The value of soap in metal drawing is reaffirmed by a recent Army Ordnance report on steel cartridge cases, by Lieutenant Colonel Harold R. Turner, in which he states that after experiments with practically every type of lubricant, soap was adopted by more than fifty percent of the manufacturers. The report says in part:

"The selection of proper lubricants to be used in drawing was quite essential to a successful result. It is undoubtedly true that somewhere in the program every type of lubricant which was offered was tried, and many of them were found to be satisfactory. In the majority of cases they were commercial products or modifications of then-existing commercial products. What appeared to be one of the best lubricants was a soap film on the draw piece . . . . . Toward the end of the program, more than fifty percent of the manufacturers were using this process. The requirement was that a uniform and continuous film of dried soap be present over the case, both inside and out, to provide lubrication both for the punch and the draw die. Some manufacturers used soap in combination with a liquid coolant, which was a light oil, since the presence of water destroyed the effectiveness of the soap."

Chicago Anticipates Increased Foreign Trade

Importers of American products in countries not dominated by the Axis powers are showing increasing interest in making trade connections with Chicago exporters for the postwar era, according to Harry Salinger, foreign trade vice president of the Chicago Association of Commerce.

The Association's foreign commerce committee, of which Mr. Salinger is chairman, expects foreign trade of the United States to reach a volume after the war greatly exceeding anything known in the past. It is now planning an elaborate promotional campaign to insure that business in Chicago gets at least a proportionate share in the anticipated expansion of exports.

London Conferences Cover Unified Design and Drafting Practice

While the problems of world screw thread standardization which were discussed at the London Conferences last August have received considerable publicity, it has been emphasized by Chairman Elmer J. Bryant of the Joint U. S.-Canadian Mission that important results were achieved in developing a unified "design and drafting practice."

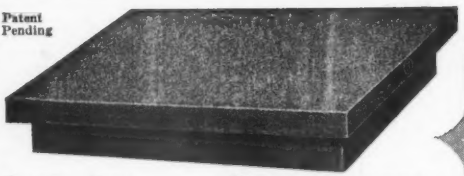
Mr. Bryant, who is Director of Research of the Greenfield Tap and Die Corporation, told the special meeting held in New York last month to receive the report of the U. S.-Canadian Screw Thread Mission that considerable discussion and agreement was reached in London on the need for a unified code of practice on drawings to indicate position, concentricity and symmetry tolerances. This would be of special help in conveying to the workmen and the inspector vital information which heretofore has been lacking on most drawings.

It was agreed that universal use of such a "design and drafting practice" would result in vast savings of time and the elimination of much confusion. Mr. Bryant feels that this particular fruitful phase of the Mission's efforts in London has perhaps been neglected in the over-all discussion of screw thread standardization.

The report was given at the special meeting sponsored by the American Standards Association, the Society of Automotive Engineers, and the American Society of Mechanical Engineers. It was at this meeting also that William L. Batt, American member of the Combined Product Resources Board, said that, "our whole machine age economy is actually held together by screw threads."

The full membership of the joint U. S.-Canadian Screw Thread Mission was as follows: Elmer J. Bryant, Chairman, Greenfield Tap and Die Corporation; James G. Morrow, Vice Chairman, The Steel Company of Canada, Ltd.; Cyril Ainsworth, The American Standards Association; Henry W. Bearce,

Patent Pending



Costs Less . . . Wears Longer With Less Trouble. . . . . .

Cut from blocks of natural granite which has been aging for millions of years, Herman Granite Surface Plates are accurate to 1/10,000 inch, unaffected by ordinary temperatures, rust, corrosion, and are warp proof.

Herman Granite Surface Plates cost no more than ordinary cast iron surface plates and last ten times as long—practically indestructible. These plates will not "lapp" "Joe Blocks" and height gauges because the surface of the plate will not become "charged". Being non-magnetic, these Granite Plates are easily cleaned—require no demagnetizing.

TEST HERMAN SURFACE PLATES IN YOUR OWN SHOP

At our expense test these plates in your own shop under existing conditions. Mail your request today for descriptive literature and prices, or request a specific date for a "shop test".

Have You Tried The New HERMAN GRANITE PRECISION SURFACE PLATE?

NATIONALLY KNOWN USERS OF HERMAN GRANITE SURFACE PLATES . . . .

General Motors	Allis-Chalmers
General Electric	Bendix
Chrysler Motors	International Harvester
Westinghouse Electric	Bausch & Lomb
Ford	Curtiss Wright

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Business Office, Harries Bldg. Dayton 2, Ohio

6 DUAL-SPIRAL REAMERS

HAVE EXPANSION RANGE EQUAL TO 30 CONVENTIONAL REAMERS

That's why the Lempco Dual-Spiral can finish-ream as many different size holes as ordinarily require 6 to 8 conventional expansion reamers. Flutes spiral in opposite directions simultaneously, eliminating chatter and producing a perfect finish in any machinable metal or plastic. Alignment reamers made with extensions and follow-pilots of variable lengths. Available individually or in boxed sets.

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- *.035" to .080" Straight Line Expansion*
- *Blades May Be Resharpened 8 to 10 Times*
- *Reams Smoothly Over Keyways, Oil Grooves Or Any Interrupted Cut*
- *New Blade Segments May Be Inserted in 30 Seconds*
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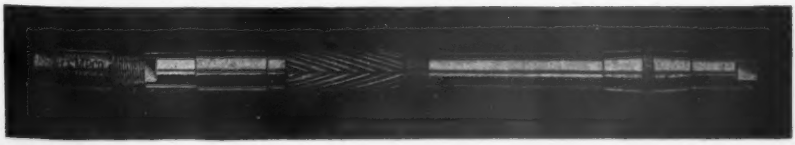


National Bureau of Standards Association; Paul J. Des Jardins, Pratt & Whitney Division; Col. Harry B. Hambleton, Ordnance Department; Neil Petersen, Canadian Acme Screw and Gear Co., Ltd.; Frank E. Richardson, Army Air Forces.

Greenfield Tap and Die Buys Geometric Tool Co.

The Greenfield Tap and Die Corporation of Greenfield, Mass., has announced the purchase of the Geometric Tool Company of New Haven, Conn.

In a statement announcing the purchase, Donald G. Millar, president of the Greenfield organization, said: "The acquisition of the Geometric Tool Company, with its splendid reputation for precision tool-making, will broaden the base of our service to industry. It will enable us to furnish the proper type of thread cutting tool required or best adapted for any job involving the production of threaded parts. It will also expand our facilities for research, screw thread engineering, and the production and distribution of precision threading tools."

Private Industrial Building Boom Predicted

Private industrial construction in 1945 will exceed public industrial construction for the first time since 1940, it was predicted at a meeting of the Producers' Council in New York recently. Basing the prediction on postwar estimates of construction, prepared by the Market Analysis Committee of the Council, Charles E. Young, economic research supervisor of the Westinghouse Electric and Manufacturing Company, said:

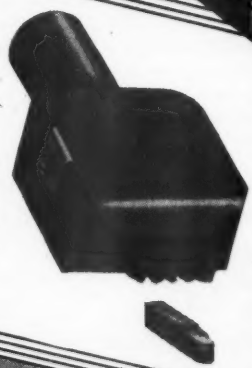
"An important factor in the probability of private industrial construction will be the necessity for highly efficient operations and economic locations of plants—which will demand specialized

For simplified gang-stamping with faster interchanging of type

HERCULES HOLDERS

Features include:

- Stamps numbers or letters in any untempered metal or material.
- Exclusive extra body and shoulder style of type for added strength.
- No parts to loosen or wear out—made of shock-resisting alloy tool steel.
- Simplest interchangeable type holder made.



Especially suited for parts numbering on steel, stainless steel and alloys, castings, brass, aluminum, etc., these HERCULES Holders are available in both hand and press styles for one, two line, curved and convexed or concaved marking. Type is removable by mere finger pressure on clip, automatically self-locking in position.

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Certainly, a good mechanic will "feel his way" through a job with all the accuracy it calls for. But he'll do it faster, with more sureness, more pride in the result and less worry over possible errors if he's got JO-BLOCKS to work with. The super-accuracy of Johansson Gage Blocks (to .000004 or .000008) is positive insurance that your coarser tolerances of thousandths or "tenths" *can be maintained*. And JO-BLOCKS are working tools, too, for laying-out, locating, scribing, checking work, as well as checking gages and mikes. Popular No. 1 Set of 81 pieces makes 120,000 different size gages in steps of .0001, from .200 of an inch to more than 12 inches. Deliveries now within 30 days. Write for catalog. Address: FORD MOTOR COMPANY, Johansson Division, Dept. TD, Dearborn, Michigan.

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GAGE BLOCKS

plant design and preclude the purchase of war plants now located in remote sections of the country."

Approval of one hundred fifty-seven standards, including more than fifty special war jobs, marked the record year's activity of the American Standards Association, according to the presidential report of Henry B. Bryans, president of ASA and vice president of Philadelphia Electric Co. Of the total number of standards, 66 were handled under the emergency procedure established for war standards. Two of the largest groups were photographic and cinematographic equipment used by the armed forces (25 standards) and standardization of components of military radio equipment, (21 standards). Standards set up under the regular ASA procedure included 38 specifications and tests on materials (most of which were submitted by the ASTM) and 29 relating to the standardization of films and photographic processes.

ASA Reports Record Activity

Mr. Bryans reports that the two most important decisions made in 1944 were, first: to broaden the scope of the work so that ASA can handle any standard or standardization project which deserves national recognition, whether in the field of engineering, accounting, business practice, or consumer goods; and, second, to place broader emphasis on the work on consumer goods.

A United Nations Standards Body, now a year old, has set up a New York office. Membership includes the United States, Great Britain, Canada, Australia, New Zealand, Brazil, China and South Africa. Mexico and Russia are expected to become members. This group has undertaken 9 projects, all war jobs or projects concerned with the transition period immediately following the war.

Plans for the industrialization of China are progressing. Howard Coon-

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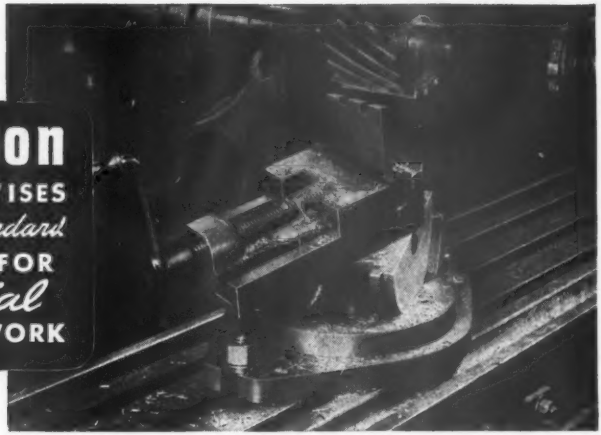

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These are high precision, top quality, 3-way angle vises that can be relied upon to slash set-up time on difficult compound angle machining with standard machine tools. Save many man-hours . . . quickly liquidate the vise cost . . . assure uniform angle accuracy in toolroom or production duty.

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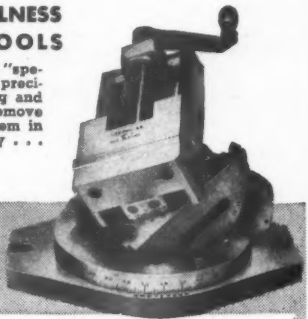

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ley, past president of ASA, is in China as advisor to the Chinese War Production Board. Dickson Reck, formerly head of the Standards Division, OPA, is in China acting as advisor on standards to the Chinese government. A Chinese Standards Commission is in operation.

The international work done during the year on screw threads has tremendous potentialities, according to Mr. Bryans. He quoted William L. Batt, vice chairman for International Supply, WPB, to the effect that differing standards in the United States and Britain in the manufacture of threaded parts have already added at least one hundred millions of dollars to the cost of the war. Difficulties because of inability to utilize interchangeability have ranged from delays and added production cost in filling lend-lease orders to the necessity for maintaining vast stocks of duplicating replacement parts in distant war theaters.

Mr. Bryans reported that the Army Ordnance Department had bestowed its Distinguished Service Award on ASA in September. He quoted General Reimel, who made the formal presentation, as follows:

"In the development of our mass-production methods, and especially in the speedy utilization of our tremendous peace-time industrial facilities for war work, the standards developed through the American Standards Association and its cooperating groups have contributed immeasurably."

Eight new national groups became members of ASA during the year, bringing the total to 85 technical, trade and governmental groups.

All national officers were reelected at the same annual meeting. In addition to Mr. Bryans, George S. Case, chairman of the Board of the Lamson and Sessions Co., was renamed vice president; H. S. Osborne of American Telephone and Telegraph Co. was reelected chairman of the Standards Council, and E. C. Crittenden of the National Bureau of Standards was reelected vice-chairman of the Standards Council.

Recent U. S. Patents

Among recently issued U. S. Patents the following are of Tooling interest. If you are interested in studying any of these Patents, simply advise "Patent In-

MEASURING A PLUG GAGE WITH LIGHT WAVES

using an optical flat, a toolmakers flat and a gage block

The formula is:

$$D = h + \left(.000012 \times N \times \frac{W}{w}\right)$$

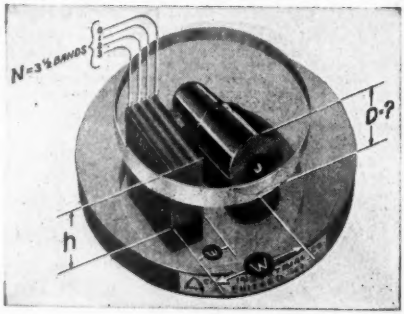
Substitute the actual values

$$D = .750 + \left(.000012 \times 3\tfrac{1}{2} \times \frac{1\ 7/16''}{23/64''}\right)$$

and get the answer

D = .750168 inch.

It's just that simple!



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Neatly Bound In 1 Quick, Easy Reference Book

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CATALOG No. C10

This new Catalog No. C10 is the last word in convenience when selecting milling tools. It's actually 5 catalogs in one, giving complete technical data on Arbors, Cutters, Vises, and other accessories and equipment. 50 pages of useful information — spirally bound in one book that opens flat and smooth for quick, easy reading — it's the type of catalog every machine-shop man wants to have around—handy! This bulletin would prove useful to your superintendent, master mechanic, tool and die men as well as your purchasing executives—send us your list on your company letterhead and we will be glad to mail copies to everyone interested in your organization. Would you tell us, please, the name of the magazine in which you saw this announcement.

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LOCKING CAM FOR TOOLHOLDERS, No. 2,343,855.
MACHINE TOOL, No. 2,343,875.
AUTOMATIC LATHE, No. 2,343,914.
RESIN MOLDING, No. 2,343,930.
MOLD FILLING APPARATUS, No. 2,343,938.
RADIUS DRESSER FOR GRINDING WHEELS. No. 2,343,949.
HAND COMPRESSION TOOL FOR DIES AND CUTTERS, No. 2,343,953.
SIZING TOOL, No. 2,344, 036.
MULTIVERSAL MACHINE TOOL AND BORING HEAD THEREFOR, No. 2,344,039.
AUTOMATIC DRILLING MACHINE, No. 2,344,053.
DEPTH GAUGE, COUNTERSINK, AND DRILL. No. 2,344,143.
METHOD OF AND MACHINE FOR MOLDING PLASTICS, No. 2,344,176.
DIMPLING TOOL, No. 2,344,944.
METHOD OF MANUFACTURING TOOTHED ELEMENTS, No. 2,344,953.
MILLING CUTTER, No. 2,344,954.
MILLING MACHINE CUTTER, No. 2,344,955.
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COLLET CHUCK, No. 2,345,069.
APPARATUS FOR MOVING TOOL MEANS IN AN IRREGULAR PATH, No. 2,345,104.
MACHINE TOOL TRACER REGULATOR, No. 2,345,116.
MACHINE FOR MAKING T'S OF METAL TUBING, No. 2,345,123.
MACHINE TOOL TRANSMISSION AND CONTROL MECHANISM, No. 2,345,171.
METHOD AND APPARATUS FOR GRINDING BALL SEATS IN STEEL ARTICLES, No. 2,345,177.
GRINDING MACHINE, No. 2,345,189.

★

Gray Iron Founders' Society Awards

The technical committee of the Gray Iron Founders' Society has established two annual awards totaling $700 for engineering student papers of outstanding merit dealing with gray iron research on designated subjects, Edward L. Roth of Milwaukee, chairman, has announced.

Instituted to stimulate wider investigation of the properties of gray irons, the awards, open to all graduate and undergraduate students in engineering and technology and expected to continue

A TOOL & DIE ROOM "Must"

Throw away your tap wrenches and save 75% of direct hand-tapping labor with this Bay State Hand Tapper.

Simple and easy to operate. Quick, accurate tapping, with minimum spoilage or breakage. Instantly ready for any job — no set up needed.

Long, hardened ground spindles with taps rigidly located at end, eliminate necessity of changing taps and use of tap extensions. Rack holds proper spindle for every job.

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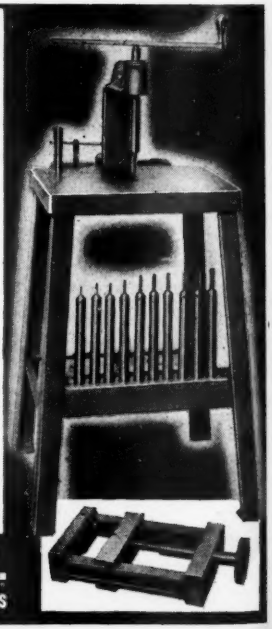
The Bay State Handy Vise for all round accurate tool room work is light in weight yet sturdily constructed of hardened and ground steel. Grips and handles thick or thin pieces for tapping, drilling, grinding or jig boring. *Write for circular:*
Distributor inquiries invited for some sections.



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HOW ABOUT THE *Late* BIRD?

Sure the early bird gets the worm, but how about the bird who is unavoidably late? Someone ought to take care of him and Hartford Chrome does! While we don't encourage last-minute work, we have the facilities to give you prompt chrome plating service when you're in a jam.

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indefinitely, consist of a first prize of $500 and a second prize of $200.

Machinability of gray irons is among the topics designated for investigation and study in the 1945 competition which closes August 5. Other subjects, any phase of which may be investigated, are creep values of gray irons at 600-800 degrees F, elongation, impact values, and modulus of elasticity. Plain or alloyed or any group of gray irons may be the material of study.

All data presented should be comparable whenever possible, the committee has ruled, with data on like properties of other engineering materials.

A committee of four judges will select the award-winners and prizes will be presented at the annual fall meeting of the society or not later than October 31.

Judges in the 1945 competition are Norman F. Hindle of the American Foundrymen's Association, Dr. E. E. Marbaker of the Mellon Institute of Industrial Research, and Donald J. Reese and Fred J. Walls of the International Nickel Company, Inc.

Meehanite Institute 16th Annual Meeting

About 200 representatives of the member foundries of the Meehanite Research Institute of America, Inc., New Rochelle, N. Y., attended the 16th Annual Meeting which was held at the Hotel Commodore, November 1-3. The program included presentation and exchange of research information as developed by member foundries, and the study of service records of wartime applications of Meehanite Castings in India, Australia, Africa, Great Britain and South America. The following officers were elected for 1945:

President: Oliver Smalley, Meehanite Metal Corporation, New Rochelle, N. Y.

First Vice President: H. B. Hanley, American Laundry Machinery Co., Rochester, N. Y.

Second Vice President: A. C. Denison, Fulton Foundry & Machine Co., Cleveland, O.

Secretary-Treas.: C. S. Nichols, Meehanite Metal Corp., Chattanooga, Tenn.

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1 *REPAIRING DIES* . . . Existing units that may fail in operation can be welded, either partially or wholly, resulting in a minimum of "down-time".

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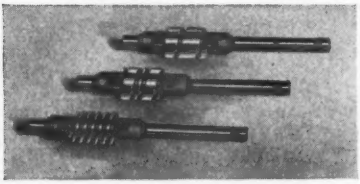
PRECISION PARTS

WORMS

To Bait the Enemy



The worm as turned.

Precision-machined parts for what it takes to destroy the enemy—Ace is turning them out by the thousands. (Ace has an Axis to grind!) These hardened-steel worm-shafts, for example, are part of vital radio equipment. The triple-lead worm-thread is ground right from the solid blank, after hardening. This insures the concentricity between the pitch-diameter of the worm and the bearing-diameter. The bearing-diameter itself is ground to a total tolerance of .0003".

Since the war began, Ace has been supplying America's outstanding manufacturers with small parts and assemblies calling for stamping, machining, heat-treating, or grinding. Ace has provided not only the industry's most modern equipment, but the skill, the background, and the ingenuity to use those machines in new ways to improve results, shorten schedules, and get the work out. Keep Ace up your sleeve for post-war plans. Occasional capacity is available for current work.

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for Precision Parts

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Ferrograph Inspection of Materials

Simple comparisons of ferrous materials as to analysis and heat-treatment are provided by the Ferrograph, a new metal-testing instrument just announced by Allen B. Du Mont Laboratories, Inc., Passaic, N. J. This instrument, available on outright sale, can be used to obtain highly useful information about iron and steel very rapidly, just as its larger and more elaborate counterpart, the Cyclograph, is licensed for a far wider range of tests on non-ferrous as well as ferrous materials.

The Ferrograph utilizes the transformer principle of operation. A 23-cycle exciting current is fed into the primary coil while the output of the secondary is influenced by the magnetic characteristics of a metal sample introduced into the coil. The voltage from the secondary is filtered and the fundamental 23-cycle wave is impressed on the horizontal axis of the cathode-ray tube. The third harmonic is viewed on the vertical axis of the instrument.

The first and third harmonics will vary in phase and amplitude with variations in the analysis and heat-treatment of steel or iron. Sorting of commonly used SAE steels is quite practical although in some cases the difference obtained is very small and may not be sufficient for sorting production lots of parts. About 80% of the mixtures of two types of iron or steel that can occur can successfully be sorted.

INFORM-A-GRAM KEY No. C54-T

Get the most out of every machine

Use GRAY-MILLS *Portable* PUMPING UNITS

to • INCREASE PRODUCTION
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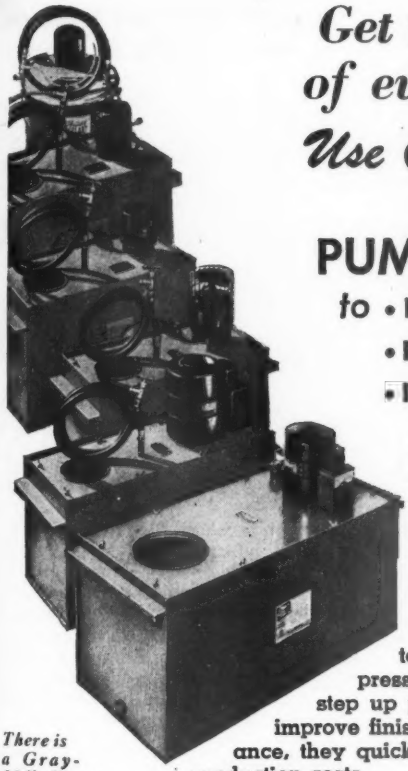

There is a Gray-Mills Pumping Unit or Pump for most every production requirement. Centrifugal Models—3600 to 2200 GPH—5' head. Gear Models—60 to 180 GPH—10 to 50 PSI.

Gray-Mills complete, portable Pumping Units are suitable for many different jobs. They apply —in controlled volume, intermittently or constantly — coolants, lubricants, quenching and hydraulic oils, chemicals and other fluids.

Widely used as coolant systems on lathes, grinders, drill presses and other machine tools, they step up production, prolong tool life and improve finish. By their dependable performance, they quickly pay for themselves in lowest production costs.

Gray-Mills Units are used also for automatic application of lubricants to punch press dies, and to provide a compact oil circulating system for machine lubrication.

Whatever your needs—you will probably find a Gray-Mills Unit or Pump the simple, low-cost answer.

Send for this new condensed catalog—gives complete details, prices and specifications.

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Complete Portable PUMPING UNITS

FRACTIONAL H. P. PUMPS
INDUSTRIAL FLUID REFRIGERATING SYSTEMS
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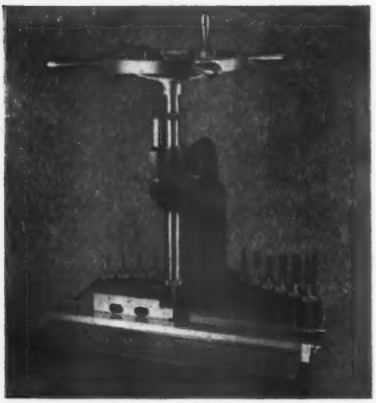

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SAVES TIME, TAPS, EXPENSIVE LABOR

1. HOLDING BARS eliminate need of vise. Hold work firmly. Prevent Tap breaking torque.
2. TAP ADAPTERS do away with extra spindles. Change taps in a jiffy.
3. DEPTH GAUGE always visible. Prevents freezing taps in blind holes Adjusted in an instant. No lost time on over tapping depth.

LASSY DEPTH GAUGE

Cuts tap breakage. Set tap in hole, set gauge at zero, ready for tapping to depth required.

Lassy Precision V Block
Angle Iron Model 15
PATENTS PENDING

For rapid accurate inspection, layout, jig boring and grinding. Hardened, normalized, ground and lapped.

LASSY TOOL COMPANY
96 Bohemia Street
PLAINVILLE, CONN.

Armstrong Tool Holders and Armide Cutter

Extension of their lines of Armstrong Carbide Tool Holders and Armide Carbide-tipped cutters is announced by Armstrong Bros. Tool Co., Dept. T, 340 N. Francisco Ave., Chicago 12, Ill.

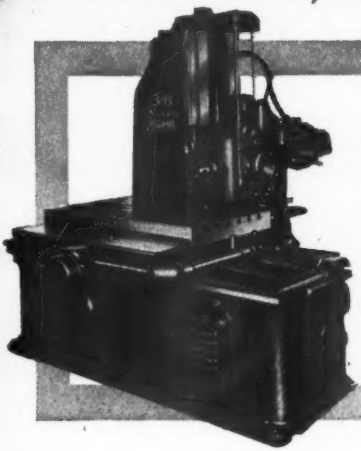
These tool holders, especially designed for use with carbide-tipped cutters, now

come with straight, right-hand offset, or left-hand offset shanks, each in seven sizes. Armide cutters come tipped with carbides of two grades—Armide Red for machining steel, and Armide Gray, for machining cast irons, brass, bronze, aluminum and non-metallics. All sizes of Armide cutters come ground to 4 standard cutter shapes, and in two weights—standard or heavy duty.

These standard carbide-tipped tools, which have been designed for general use in tool rooms, machine shops and maintenance departments, will be distributed through industrial supply houses, either singly or in matched tool holder and cutter sets. The sets will be boxed in fitted steel cases.

Emphasizing the significance of their announcement, William T. Armstrong said that the general adaptation of carbide cutting tools has brought about widespread use of his company's products. "Now," he pointed out, "even the smallest machine shop can have carbide cutting tools, can pick them up for a nominal price from stock at the nearest tool dealer. This is a significant change from the day when Krupp held the price at something over $400 per pound and sales were restricted to exceedingly expensive form tools for only the largest large-scale production operations."

INFORM-A-GRAM KEY No. C56-T



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"TWO TO THREE TIMES the production and higher quality work" is what users are saying about the 3-B DeVlieg JIGMIL—and here are some of the reasons why the results are better: 1. Automatic positioning of spindle from one location to another in response to measuring rods and push buttons to within less than .0001 (one ten-thousandth part of an inch). 2. Feather touch, pressure controlled slide locks that positively control locking uniformity, so essential to high precision work. 3. Unique operation and controls that make possible high precision work with relatively little skill.

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The JIGMIL does most production boring and milling work faster and more accurately with rugged tools working in the open than is possible with the part trapped inside the walls of a boring fixture.

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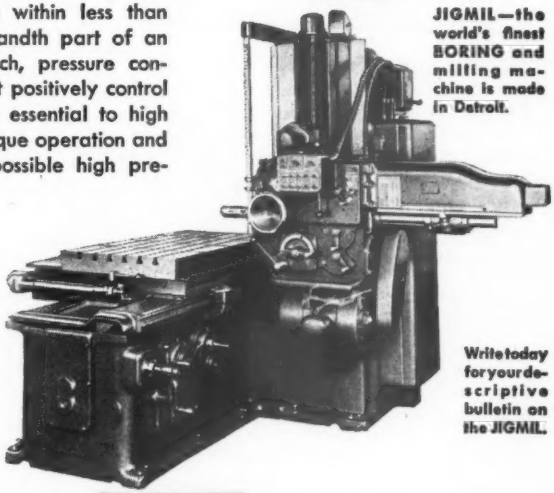

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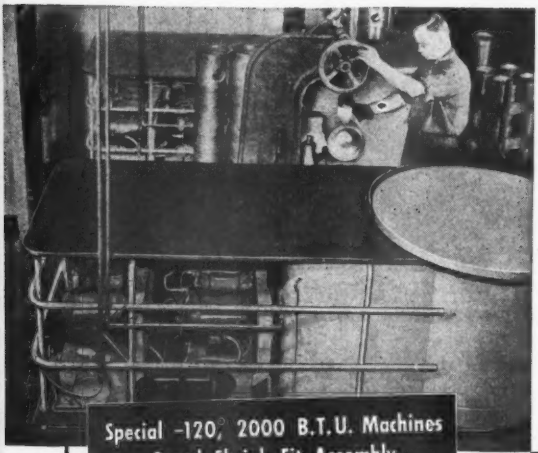

Special -120° 2000 B.T.U. Machines Speed Shrink-Fit Assembly

Industrial Chilling Machine

This job required the insertion of bronze bushings into cast iron and aluminum pistons. Three former methods, using locking screws and shrink-fit assembly, both with dry ice and liquid air, proved costly and unsatisfactory. To remedy these conditions two special Deepfreeze Industrial Chilling Machines are used in the following manner:

Bushings are immersed in the Deepfreeze machines at −120° F. for 3 hours. Then with the aid of an arbor press and a special cradle fixture for lining piston bore with arbor press spindle and also serving as a stop for the bushing to locate it in the piston, the parts are easily assembled.

The Deepfreeze Saves Labor and Production Costs

Results from employing the Deepfreeze shrink-fit method are excellent. Rate of assembly is increased over former methods from 200 to 700 parts in 20 hours; only one operator instead of two is required; actual operating costs are drastically reduced.

Learn How Cold Treating Can Be Applied to Your Production

Deepfreeze Engineering Service will be pleased to inform you how cold treating can be applied to your production. Your inquiry will not obligate you in any way.

FREE . . . Complete Cold Treating Data

A comprehensive, up-to-date account of cold treating is contained in this new 40-page booklet. You can use this information to advantage. Send today for your copy of Bulletin No. I-4.

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Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

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DIE SUPPLIES CATALOGS containing complete information on hand knobs, quarter-turn screws, socket head shoulder screws, "C" washers, spherical washers, locating keys, die springs and music wire compression springs have recently been issued by the DIE SUPPLY CO., Dept. T, 4747 Hough Ave., Cleveland 3,

O. The line drawings shown were prepared expressly for use as templates in tracing. These supplementary catalogs 3A and 3B should be of interest to those in the tool and die and machine shop fields since Die Supply carries a wide line of items not always quickly obtainable these days.
INFORM-A-GRAM KEY No. 550-T

"AIRGRIP" PNEUMATIC AND HYDRAULIC Holding Devices are described in an illustrated catalog published by ANKER-HOLTH MFG. CO., Dept. D, 332 S. Michigan Ave., Chicago 4, Ill. The "Airgrip" Three Jaw Universal Chucks are designed to permit heavier cuts and coarser feeds, saving time and effort in production, and are of special service in heavy production work. Distinctive features of "Airgrip" Model "D" Air Cylinders include double ball bearing, permitting speeds heretofore impossible, no manual adjustments required, balanced air pressure—no end thrust, minimum friction, sturdy dependable construction, long life—low maintenance.
INFORM-A-GRAM KEY No. 952-T

HIGH-SPEED BENCH SURFACE GRINDER, designed especially for the fussy little jobs which must be held to a tenth, is described in an illustrated 8-page booklet issued by the SANFORD MANUFACTURING CO., Dept. TJ, 1279-81 Springfield Ave., Irvington 11, N. J. These grinders will produce fine finishes to .0001" tolerances over a long period of time if given normal careful treatment. Close grained Meehanite, used at all points of wear, gives longer life and greater vibration damping capacity.
INFORM-A-GRAM KEY No. 128-T

DRILL JIG BUSHINGS are featured in Catalog No. 243 available from the ACCURATE BUSHING CO., Dept. T, Garwood, N. J. A brief description of each type of bushing is given on each table together with the most common applications. Headless press fit bushings are used whenever it is desirable to have the bushing flush with the jig plate; also in those cases where the distances between centers of the holes to be drilled are too short to permit the use of bushings with heads.
INFORM-A-GRAM KEY No. 811-T

BARKER WRENCHLESS CHUCKS AND VISES which increase production, lower machining costs, reduce operator fatigue and cut spoilage are described and illustrated in Bulletin 201 published by the THOMAS HOIST CO., Dept. T, 20 S. Hoyne Ave., Chicago 12, Ill. These chucks require no accessories and are simple to install on turrets, engine lathes, as well as on semi-automatic, pipe threading and cutting off machines. The Barker Drill

Press Vise, operated by a lever, sets and removes the work without the use of a wrench when facing, tapping, reaming, drilling, milling, countersinking, counterboring, and when holding work on assembly operations.
INFORM-A-GRAM KEY No. C48-T

PRECISION PRODUCTION TOOLS are pictorially described in Catalog No. 44 published by the ACME TOOL CO., Dept. J, 196 Church St., New York 13, N. Y. Included among the tools shown are boring bars, carbide tools, air guns, flexible shaft machines, Meehanite angle and surface plates, and bench vises. Their swivel base milling machine vise is made in the Master and the Junior sizes. They are suitable for milling machines, drill presses or shapers.
INFORM-A-GRAM KEY No. 69-T

SUN DIAL INDICATOR GAUGES for depth, length, thickness, height, location and special measurements are featured in a descriptive folder issued by the SUN TOOL & GAUGE CORP., Dept. J, 380 Canal St., New York, N. Y. These gauges, designed to meet your requirements, enable readings of variations as small as .0001". Each individual depth and length dimension can be visually checked, and errors determined. A simple master setting gauge, supplied with each Sun Dial Indicator Gauge, provides a quick and reliable method of setting and checking.
INFORM-A-GRAM KEY No. 955-T

ARBORS AND ACCESSORIES are presented in Bulletin 116 published by the KEMPSMITH MACHINE CO., Dept. TD, Milwaukee 14, Wis. These standard attachments can be used on any milling machine regardless of make, as long as it is equipped with a National Standard spindle end. Arbors are equipped with standard keys which are cut in sections throughout their entire length for convenient insertion.
INFORM-A-GRAM KEY No. C47-T

MILLING MACHINES and attachments are described in an illustrated circular published by BURKE MACHINE TOOL CO., Dept. T, 301 E. 16th St., Conneaut, Ohio. These tools can also be used as Jig Borers, and as no weight has been sacrificed, they will perform any work within their dimensional capacity. All screws have graduated dials, graduated in .001".
INFORM-A-GRAM KEY No. 661-T

ELLIS PRECISION DIVIDING HEAD is featured in a new circular issued by the NICHOLS-MORRIS CORP., Dept. D, 50 Church St., New York 7, N. Y. Positive adjustment is provided between the precision ground worm and worm gear to insure life-time freedom from spindle back lash. The auxiliary swivel base makes possible quick accurate work setting to compound angles, swinging through 360° in the horizontal plane, and in excess of 100° in the vertical plane. This valuable feature effectively converts a conventional dividing head into a universal work head or rotary

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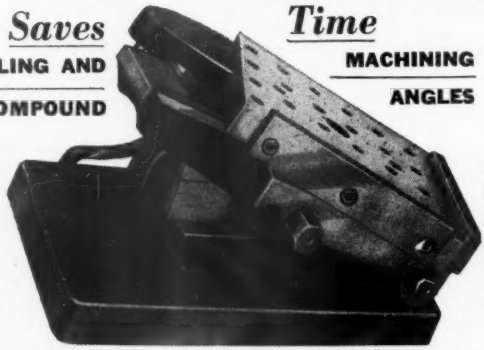

Roto-Sine uses new method of obtaining both single and compound angles. By use of gage blocks, Roto-Sine provides accurate, quick means of obtaining angles of rotation without use of graduations. Every tool shop will find Roto-Sine the answer to efficient, accurate angle set-ups.

Available in 5 inch and 10 inch models.
Table sizes—
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No longer necessary to obtain angles of rotation from graduations

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table, thereby increasing the versatility of any Miller, Grinder, Drill Press, or Jig Borer.
INFORM-A-GRAM KEY No. 943-T

ANGLEMASTER SINE VISES for straight and angular work are featured in a 4-page leaflet available from the IDEAL TOOL & DIE CO., INC., Dept. TJ, 735 Congress St., Schenectady 3, N. Y. Model No. 2 tilts one way and is equipped with one pair of transverse sine rolls which are perfectly parallel to the faces of the jaws and are attached to recessed surfaces in the base. Any surface can be used —bottom, sides, top, or end—all are perfectly square or parallel with each other.
INFORM-A-GRAM KEY No. 147-T

PRECISION LATHES including engine, toolroom and turret lathes are fully described in Catalog No. 100-D recently issued by SOUTH BEND LATHE WORKS, Dept. TJ, South Bend 22, Ind. Engine lathes and toolroom lathes are shown in five sizes, ranging from 9" to 16" swing. There are two sizes of precision turret lathes; ½" and 1" collet capacity respectively. Complete specifications are listed opposite each lathe illustration giving capacities, speeds, feeds and dimensions. Considerable space is devoted to construction features of the lathe, lathe tools and attachments for special classes of work.
INFORM-A-GRAM KEY No. 564-T

ILLITRON, a new method of high frequency induction heating recommended for surface hardening, brazing, soldering, melting, forging and annealing, is discussed in an illustrated bulletin issued by ILLINOIS TOOL WORKS, Dept. T, 2501 N. Keeler Ave., Chicago 39, Ill. Designed to perform a new electrical method of induction heating which provides for rematching, Illitron makes possible the heat treatment of high speed steel and other high temperature alloys with low rated power capacity and temperatures of 2300° F.
INFORM-A-GRAM KEY No. 830-T

MARVECO LIVE CENTER, designed to give the greatest possible service on extra heavy or high speed lathe-grinder-thread mill applications, is described in an 8-page booklet issued by MARVEL TOOL & MACHINE CO., Dept. J, 10973 W. Jefferson Ave., River Rouge 18, Mich. This live center is the only one made which has an automatic takeup to compensate for wear of the bearings. Chatter, center regrinds and scrap due to inaccurate or worn centers are eliminated by its use.
INFORM-A-GRAM KEY No. 920-T

"580 AIDS TO PRODUCTION AND POST-WAR PLANNING" are offered in the new Gorton Accessories Catalog. Many of the accessories shown can be adapted to use on other machines. Cutters, circular tables, chucks and collets, jig boring tools, vises and numerous

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Hy-Draulic Shapers are popular alike with men and management in the modern, efficient, compact plant of Koppy & De Korse Tool and Die Co., Detroit, Michigan. This means much when you see the extremely precise tools and dies in process throughout the shop. Some of these are very complicated, many call for additional interchangeable parts, all require great skill, care and patience for successful completion. That is why the "handy" features of Hy-Draulic Shapers get special mention here. It is so easy to set up work on Hy-Draulic Shapers, to select the *exact* combination of cutting speed and feed for each job, to establish stroke length and position without using tools or scarcely stopping the machine. Toolmakers are free to concentrate on details of the job in process and its prompt production. This simplifies the work of management, creates satisfied customers, builds good will and new business. Investigate the advantages of Hy-Draulic Shapers on your work. Write, today, for Bulletin 2501.

4410

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS

prices, are included along with complete information on Gorton cutter grinders and grinding wheels. This Catalog, 1317-F, is available from the GEORGE GORTON MACHINE CO., Dept. T, 1211 Racine St., Racine, Wis.
INFORM-A-GRAM KEY No. 711-T

ECCENTRIC DRIVES are featured in an illustrated booklet published by the MORELAND TOOL CO., Dept. J, 16935 W. McNichols Rd., Detroit 19, Mich. Utilizing the eccentric principle in its design to completely equalize the torque load between the holder and the mating driven cutting member, Moreland has introduced a counterbore drive that is shearproof. Illustrations, specifications, diagrams, and tables of decimal and millimeter equivalents are included.
INFORM-A-GRAM KEY No. A47-T

RETRIEVER HOSE REELS which promote safety and increase efficiency have been developed by the WAYNE PUMP CO., Dept. J, Fort Wayne 4, Ind. These reels prolong the life of the hose by keeping it off the floor where it would be subject to damage from grease and oil, bruising, cutting or kinking. The hose unrolls freely and is retrieved quickly by an automatic rewind spring. They are easily installed on ceilings, walls or floors, above benches, under benches or in any central position where they may serve several operators and machines.
INFORM-A-GRAM KEY No. 745-T

CUTTING TOOLS are attractively presented in a compact, 116-page catalog recently released by the LAKE SHORE TOOL WORKS, Dept. T, 816 N. Kostner Ave., Chicago 51, Ill. Milling cutters, hobs, gear cutters, broaches, miscellaneous tools, carbide tipped tools and other special tools are featured. Large, clear illustrations are supplemented by concise descriptions and well organized dimensional and price information. Copies may be obtained by requests written on company letterheads.
INFORM-A-GRAM KEY No. C46-T

DE BURRETTING — a precision-machined parts finishing process is featured in a leaflet issued by the DE BURR BARREL CO., Inc., Dept. D, 4579 Hollywood Blvd., Los Angeles 27, Cal. De Burrettes which cushion the load as they grind and polish are used dry. Made from soft Neoprene rubber impregnated with the universally accepted aluminum oxide abrasive, they de-burr soft metal and hardened steel parts and impart a smooth over-all finish.
INFORM-A-GRAM KEY No. C49-T

CLEANING AND BUFFING of metal parts are interestingly described in an informative booklet published by the PURITAN MANUFACTURING CO., Dept. TD, Waterbury, Conn.

HOGGSON BRAND
HAND CUT
STEEL STAMPS
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CHAMFERED
CORNERS --
FOR LOCATING
BASE OF LETTER
Long Service
CLEAN, SHARP IMPRESSIONS
Deep, hand-cut letters done in special formula steel, the result of 90 years of die making. Faces angled for extreme strength. Ideal for parts identification, tool marking, numbering, etc. Available through mill supply houses.
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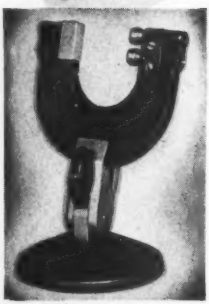
Speed your inspection *with a Production Set of* ATLANTIC *Adjustable Limit* SNAP GAGES

FOUR COMPLETE SETS
6, 10, 12 or 19 gages



To speed up gaging, use the Scherr Tool Stand, which frees both hands of operator, and prevents transmission of body heat to the gage. Price $7.50.

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These sets permit instant inspection with minimum dependence on operator's skill. The untrained operator quickly learns how to check dimensions on machined, turned or ground work by the fast, accurate "go" and "no-go" method.

Frames are of Meehanite for unchanging rigidity. Gaging buttons are lapped to parallelism with extreme accuracy. Gages shipped unsealed and unset, or set to specified size. In two types — Type A, as above, and Type C with solid anvil, as shown at left. Special anvils, quotation on request. Immediate delivery.

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Atlantic Adjustable Limit Snap Gages are made with all care to sustain the quality reputation held by Scherr products for the past quarter-century. Descriptive bulletin on request, or order direct.

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If not already equipped with gage blocks, write for details on our Ultra-Chex Gage Blocks, giving you 80,000 combinations in steps of 1/10,000. Price $125.00.

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INFORM-A-GRAM KEY No. C43-T

"RESISTANCE WELDING ELECTRODES AND ALLOYS" is the title of a new catalog recently issued by P. R. MALLORY & CO., INC., Dept. T, 3029 E. Washington St., Indianapolis 6, Ind. Their complete line of standard spot welding electrodes and water-cooled holders are listed along with "Do's and Don'ts" for improved resistance welding. Stock sizes of Mallory Alloys, their various applications and typical physical properties are also included.
INFORM-A-GRAM KEY No. 873-T

BLUEPRINT FOR INDUSTRY. Part III, is a 4-page leaflet containing engineering information on the constant-speed, constant-tension wind-up machine for wire, cable, cords, rope, paper, tapes of various kinds, textiles and coated fabrics. This machine, designed to meet strict Army-Navy specifications for uniform and concentric finishes in impregnation and coating of wire and cable insulation, is a complete, self-contained unit with combination variable speed and hydraulic synchronizing equipment. By arrangement of adjustable counter-weights, wire tension can be varied from a few ounces to hundreds of pounds. It is motor driven and requires no outside source of power or synchronization. This literature is available from INDUSTRIAL OVEN ENGINEERING CO., Dept. J, 11621 Detroit Ave., Cleveland, Ohio.
INFORM-A-GRAM KEY No. C18-T

FASTENING APPLICATION BULLETIN recently issued by SHAKEPROOF, INC., Dept. TJ, 2501 N. Keeler Ave., Chicago, Ill., shows typical applications of Shakeproof Thread-Cutting Screws to metal and plastics. Each screw cuts its own perfect mating thread as it is driven, i.e., taps and fastens in one operation, thus reduces costs and improves product performance. This bulletin is the first of a series that will inform you of the latest fastening developments and their applications.
INFORM-A-GRAM KEY No. 700-T

COOLANT & SLUDGE TANKS are diagrammed and described in a booklet issued by HAPMAN CONVEYORS, INC., Dept. TJ, 308 Boulevard Bldg., Detroit 2, Mich. These coolant tanks were primarily designed to meet the need for individually operated tanks for

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The best "soft" hammers and mallets are rawhide — tough, resilient, long-lasting C/R mechanical rawhide. They strike effective blows without battering or marring . . . without fatiguing re-coil. They hold their true striking surfaces. Sizes and weights for every need. Hammers are malleable iron with replaceable C/R Rawhide insert faces.
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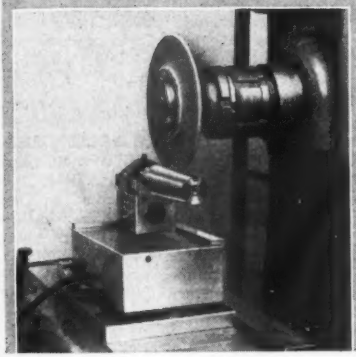

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The MAGNA SINE

FOR INSPECTION
The Robbins SINE PLATE

The Magna Sine provides the fastest and most accurate way of making both single and double angle angular grinding set-ups. It employs the sine block method of determining the angle, the most accurate method known. The part is held firmly, but without distortion, at the turn of a switch. The Magna Sine is sturdily built to precision limits and will provide years of trouble-free service. Available in two sizes in both single and double angle models.

The Robbins Sine Plate is a non-magnetic counterpart of the Magna Sine. It is built with the same care and accuracy as the Magna Sine. Inspection set-ups can be made in a matter of seconds.

The Sine Plate is also usable for making angular set-ups for jig boring. It is available in the same sizes and models as the Magna Sine.

ROBBINS ENGINEERING COMPANY
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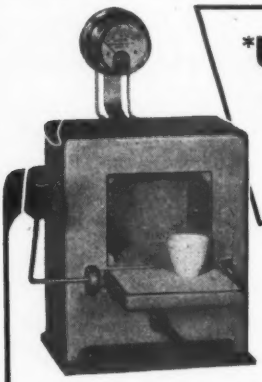
servicing single machines. Soluble oil coolants are best handled with individual tanks, as coolant contamination cannot then spread from one machine to another. The tanks are self cleaning in that all sludge is deposited efficiently and positively into sludge buckets, waste dry, without loss of coolant. Each tank is equipped with a 2" pipe conveyor consisting of solid Buna N synthetic rubber flights mounted on a detachable conveyor chain, for which a single sprocket used as the driver is required.
INFORM-A-GRAM KE YNo. C20-T

SEAMLESS TUBING TOLERANCE information is contained in a new bulletin published by the TUBE REDUCING CORP., Dept. J, Wallington, N. J. This booklet should be of interest to designing engineers and production-machine-shop executives. Its information is pertinent to the production of metal parts of generally cylindrical form that can be made from tube stock, such as ferrules, bushings, spacers, sleeves, small pressure cylinders, bar and roller bearing race, hollow shafting, etc. It explains in detail the reduction method by which Rockrite Tubing is made and gives basic information about the principal methods used to size hot-rolled tubing.
INFORM-A-GRAM KEY No. C24-T

NEW FLOW HEAT TREATMENT folder which indicates the steps, baths, temperatures, times and equipment used for flow heat treatment has been recently issued by the A. F. HOLDEN CO., Dept. D, New Haven 8, Conn. Technical information as to the physical properties obtainable through this process is given. The hardening bath may be operated at temperatures of 1450-1700° F. depending on the steel and is designed to produce a minimum specific gravity and low chemical consumption without sludging of the quenching bath.
INFORM-A-GRAM KEY No. 150-T

PLATING EQUIPMENT & ACCESSORIES are described in a series of illustrated circulars issued by the UDYLITE CORP., Dept. D, 1651 E. Grand Blvd., Detroit, Mich. The Udylite Handiplater is ideal for plating odd lots of small parts. It is completely portable and can be plugged into any convenient 110 volt, A.C. lighting circuit for power supply. Koroseal, a synthetic elastic material which resists strong oxidizing acids and corrosives, may be applied as linings to wood, steel, concrete or other materials.
INFORM-A-GRAM KEY No. C19-T

SUPER-SPEED PIERCING of sheet metal through templates by the Wiedemann R-44 Turret Punch Press is described in a 4-page leaflet issued by the WIEDEMANN MACHINE



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● The heating element in the Temco furnace operates with unusual speed. A working temperature of 1500° F. is attained in only 30 minutes and intermittent peak loads of 1850° F. are within the practical range of this rugged, long life furnace. A four point switch provides temperature control in four ranges and adjustable rheostat bands allow close heat selection within any range. The accurate, dependable pyrometer is calibrated to 2000° F. and 1100° C. in 50° increments.

***MUFFLE CHAMBER** has the exclusive feature of an embedded heating element which covers all four sides of the heating chamber. This eliminates "cold spots", assures a uniform temperature in every part of the chamber, and protects the elements against damage and oxidation.

Temco furnaces are built for either 115 V. or 230 V. current consumption 1200 watt maximum. Heating chamber 4" wide, 3¾" high and deep. Outside dimensions 8¾"x 13½"x10". Shipping weight 30 lbs. **COMPLETE WITH PYROMETER (115 V.)**.....**$42.50**
For 230 V.—$5.00 additional

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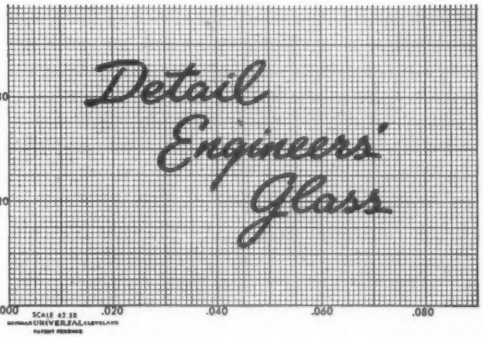
Your IDEAL GUIDE in making Precise Charts for your OPTICAL COMPARATORS, OPTICAL PROJECTORS, SHADOWGRAPHS



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Your accurate layouts can be drawn on the vellum, by the aid of these lines, with either pencil or pen. You can make erasures time and again if alterations are desired, yet the blue lines will remain as clear as before.

Your layouts may be reproduced by us as Engineers'- Transparency Charts, in which the blue ruled lines will be eliminated.

Detailed Engineers'-Glass, Scribing, is also available—in the same magnifications as Detail Engineers'-Glass, Translucent. Your scribing can be made at the desired magnification without mathematical computation.

For complete descriptions write for your copy of Bulletin DEG-11-44. It also introduces a series of highly desirable Grid Charts for Optical Projectors.

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TWIN PLANTS

1919 EAST 19th STREET
CLEVELAND 15, OHIO

CO., Dept. T, 1815 Sedgley Ave., Philadelphia 32, Pa. Described fully is the principle that cuts production time from hours to minutes by eliminating the time usually required to drill hole positions and then open them up to correct size and shape, by piercing through templates, and by minimizing handling time while the material is in the template on the press. Also included are descriptions of the safe tripping mechanism which prevents piercing the template in error and suggested methods of clamping templates to the work.
INFORM-A-GRAM KEY No. 818-T

POSITIVE DRIVE COLLET CHUCK DRILL ADAPTOR is pictorially described in a 4-page folder released by the ZEPHYR MANUFACTURING CO., Dept. T, Inglewood, Cal. Illustrations show how drills with broken shank ends can be kept on the job by rough grinding a simple flat on the side of the broken drill. This flat slips past a driving pin in the head of the collet and in operation this pin does the driving. The collet holds the drill in alignment and the collet nut locks the drill in place.
INFORM-A-GRAM KEY No. C22-T

YORK ACCESSORIES & SUPPLIES for refrigeration and air conditioning plants are illustrated in a new catalog published by the YORK CORP., Dept. TDJ, York, Pa. The book is designed to give quick, complete "fingertip" information under the following headings: accessories and supplies, ice cans and air fittings, valves and fittings, oil, cold storage doors, renewal parts, tables and data. Under the latter, sizes, weights, performance data, net prices, photographs, mechanical drawings, descriptions, and so forth, have been included.
INFORM-A-GRAM KEY No. B16-T

A NEW METHOD OF DEBURRING & FINISHING metal parts and castings is described in an illustrated new folder entitled "Slash Time and Cost with Roto-Finish". Recently published by THE STURGIS PRODUCTS CO., Dept. TJ, 300 Jacobs St., Sturgis, Mich., owners of the potential Roto-Finish process, it shows how hand methods for deburring and finishing are eliminated and how these jobs are performed mechanically on a production-line basis quicker and more economically.
INFORM-A-GRAM KEY No. C17-T

"MEEHANITE — THE METAL FOR HEAT RESISTING CASTINGS" is the title of Bulletin No. 21 recently prepared by the MEEHANITE RESEARCH INSTITUTE OF AMERICA, INC., Dept. J, Pershing Square Bldg., New Rochelle, N. Y. Typical applications of various special heat resisting Meehanite Castings are illustrated and various property data are tabulated.
INFORM-A-GRAM KEY No. 388-T

A modern, high speed, low cost production unit for cutting off rods, bars, tubes or odd shapes to lengths. Extremely accurate. Narrow kerf saves costly metal. Labor saving automatic operation. No heat generation. Long life for saws.

Coolant attachment is compact and has no messy floor pans.

Portable and plugs in anywhere. Casters optional.

Machine can be furnished without coolant for intermittent cutting.

Two sizes—8″ x 16″ and 8″ x 24″.

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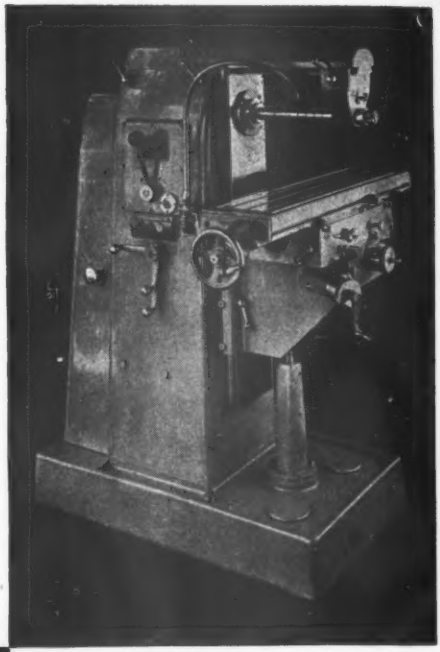
HIGH SPEED PRECISION MILLER

32" x 8"



The precision that is built into the Douglas Miller provides efficiency and speed to produce small parts requiring the extreme accuracy essential for today's production.

Rigid well balanced design combined with central control makes for easy operation and permits the release of highly skilled labor for other tasks.

A wide selection of speeds meets all requirements for tool-room and production—ample variety of feeds from which to choose.

Timken bearings and helical drive gears are other features to assure a smooth performance. Write Dept. C-1 today for specifications and prices on standard machine and milling attachments available to round out its scope. Prompt Delivery.

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PUBLICATION PREVIEWS

STRUCTURAL ALUMINUM WELDER BULLETIN. No. 103, available from the PROGRESSIVE WELDER CO., Dept. T, 3050 E. Outer Dr., Detroit 12, Mich., describes the company's new Rocker-Arm Welder designed for making between 500 and 1000 sound spot welds per hour on structural sections of aluminum ranging up to two ⅛" thicknesses of 24-ST. A feature of this machine is the rigidity of the frame which insures that deflections caused by maximum welding pressures are virtually negligible at bearings or transformers.
INFORM-A-GRAM KEY No. 146-T

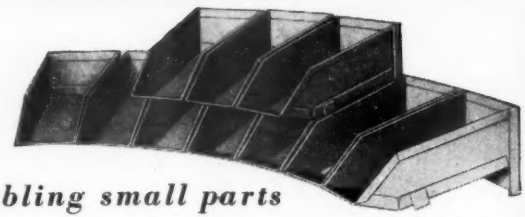
HYDRAULIC DIECASTING MACHINES — Illustrated descriptions of these high-pressure machines, made for casting aluminum, magnesium, brass or lead, tin and zinc, are presented in a six-page folder released by the CLEVELAND AUTOMATIC MACHINE CO., Dept. D, Cleveland, Ohio. Both the aluminum-magnesium-brass and the lead-tin-zinc setups are illustrated, together with identification of some of the outstanding Cleveland-built features and specifications of both types.
INFORM-A-GRAM KEY No. 238-T

CRUCIBLE MELTERS' HANDBOOK — This treatise on crucible furnaces and on the storing, handling and use of crucibles has recently been released for distribution by the CRUCIBLE MANUFACTURERS' ASSOCIATION, Dept. TD, 90 West St., New York 6, N. Y. The pamphlet is illustrated with many actual scenes of crucible installations and contains a table of standard sizes of crucibles and their dimensions; a table of melting points of various metals; a table of the composition of steam or red brass alloys; and a tabulation of the approximate composition and physical properties of aluminum sand casting alloys.
INFORM-A-GRAM KEY No. C16-T

AUTOMATIC TUBE MASTER for squaring, burring, flaring and beading ferrous and nonferrous tubing, sizes ⅛" to 3" O.D., is now available to the industry by the LEONARD PRECISION PRODUCTS CO., Dept. TD, Garden Grove, Calif. Due to the development of larger aircraft, Model 3CP, the newest of the line of Leonard Tube Masters, was developed and perfected as a completely automatic machine at the urgent request of the major aircraft companies. Uniformity of finish can be maintained indefinitely to exact predetermined specifications. An illustrated bulletin is available from the company.
INFORM-A-GRAM KEY No. C44-T

"NEW APPROACHES TO SURFACE PROTECTION", the title of a new pamphlet published by PREFERRED UTILITIES MFG. CORP., Dept. DJ, 1860 Broadway, New York 23, N. Y., is primarily a technical discussion of highly desirable advantages ascribed to the Preferred preparations, White Hot and Pyro-Chrome.

NEW BINS



for assembling small parts

Floors slope to feed parts to front — end reaching and fumbling.

Bins taper toward front to form convenient semi-circle — keep all bins within easy reach.

Nesting, locking construction for rigid set-ups, easily changed when necessary.

All-welded construction. Rolled, smooth edges.

Two sizes—tapered or straight edges. Hoppers available for steady work.

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to our customers, both old and new, for our delivery delays of the past few months. We have tripled production four times in the past four years to meet the phenomenal demand for Marvecos, but this was not enough. We are now doubling production again and within the next few weeks better delivery will be assured.

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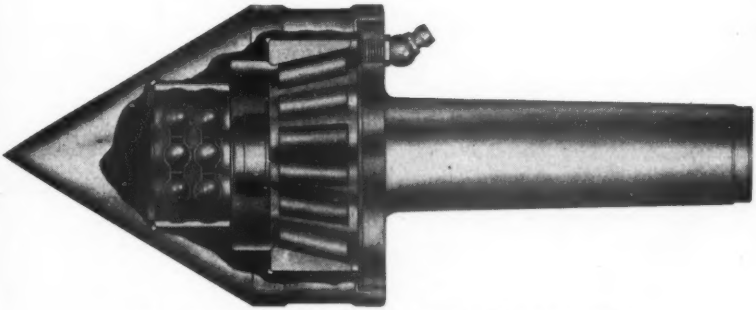

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These protective coatings take advantage of properties of heat reflectance. A series of interesting new graphs show the relative reflectance values of different colors found in refractories and other heat-resisting surfaces. White and green are shown to have the highest heat reflectance properties.
INFORM-A-GRAM KEY No. B17-T

SIMLOCK FASTENERS are described in a profusely illustrated Catalog No. 444 released by the SIMMONS MACHINE TOOL CORP., Simlock Div., Dept. T, North Broadway, Albany, N. Y. Simlock fastens and unfastens two sheets of metal or plywood without requiring the laborious and fumbling operation of screwing and unscrewing bolts. Its other features include a standard stud which is self-ejecting when unlocked, a case-hardened threaded receptacle, safety ring, splines for locking receptacle in desired position and the lock ring for permanent installation. Industries engaged in postwar designing and manufacturing will find this booklet interesting.
INFORM-A-GRAM KEY No. 464-T

3-M GRINDING AND FINISHING METHOD—This high-speed means of grinding and finishing flat or curved surfaces with 3-M Abrasive Belts and the correct Segment Face Contact Wheel is described in a booklet available from the MINNESOTA MINING & MFG. CO., Dept. T, St. Paul 6, Minn. In addition to the abrasive belts and contact wheels a drive unit and one or more idler pulleys are included. A typical bench backstand idler setup for the grinding and finishing of small tools and machined, stamped and cast parts is pictured. This compact unit requires bench space of only 22" x 28". The cool-running, long-wearing 3-M Abrasive Bench Backstand Belts make short work of removing burrs, mold marks, tool marks, scratches and other surface imperfections.
INFORM-A-GRAM KEY No. 398-T

CIRCULAR COLD SAWING OF METALS by the Triple-Chip Method is presented in an illustrated 60-page manual published by the MOTCH & MERRYWEATHER MACHINERY CO., Dept. D, 718 Penton Bldg., Cleveland, Ohio. The three pieces of equipment involved in the Triple-Chip Method are the blade, the machine that uses it, and the grinder that sharpens it. The General Purpose Machines are designed for sawing ferrous metals, such as steel and cast iron, as well as for structural shapes and forgings. The Non-Ferrous Machines are of two kinds: High Speed Models, for sawing aluminum, magnesium, and their alloys, also for copper and brass alloys; and High Single Speed Models, for certain grades of aluminum.
INFORM-A-GRAM KEY No. 403-T

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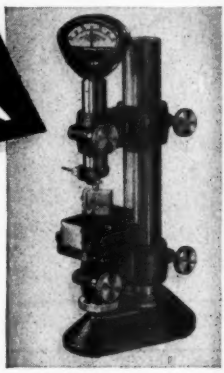

NO friction, lag or backlash . . . no racks, pinions, gears, levers, etc. subject to wear. Pointer responds instantly without swinging past true reading. Amplification is 100% mechanical, no lights or electromagnets, no warming up period required. Easily moved to different locations as there are no electrical connections. Our engineering department is at your service for applying Mikrokator to your measuring problem.

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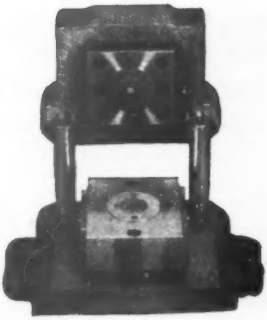

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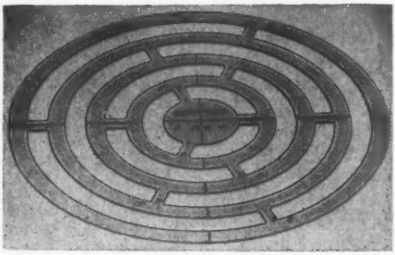

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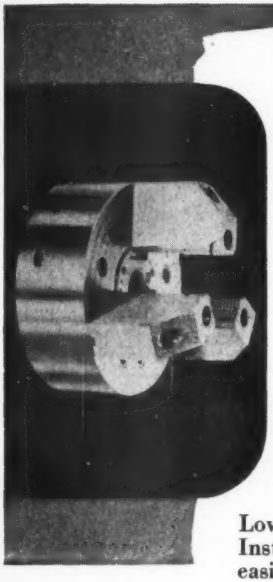
In the pressure cleaning tank, the continuously filtered solution under 6 to 10 lbs. pressure is forced through each bearing. Filtered compressed air re-

moves all surplus solvent from the bearing while it is still on the pressure cleaning spindle. The result is a perfectly functioning unit.

The rotary cleaning unit basket is 5½" ID x 3⅜" deep. Weight of machine is under 200 lbs. Current 110V, AC. All controls are mounted on a panel at front of machine. Unit has casters for easy mobility.

Detailed information is available from the L & R Manufacturing Co., Dept. T, 577 Elm St., Arlington, N. J.
INFORM-A-GRAM KEY No. 352-T



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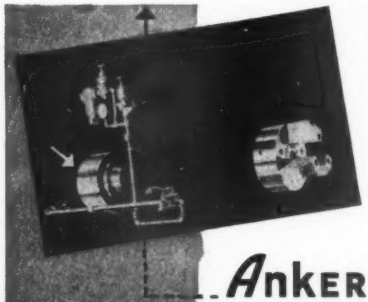

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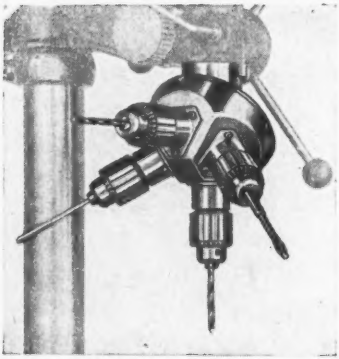

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Multiply drill press production 4 times with the new QUADRILL. Attaches directly to the quill of most drill presses. Three drills remain stationary for safety while only drill in work position operates. Actually converts a single drill press into four. Does away with moving work from press to press and reduces frequent changes of tools. Saves floor space. All this and more. Write for complete details and prices today.

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New Sheffield Precision Height Indicator

A new type of Precision Height Indicator with Electrigage that gives a quick, positive and accurate reading is announced by the Sheffield Corp., Dept. J, Dayton, Ohio. It is designed for use on a surface plate, whether in the toolroom, in process, or wherever highly accurate inspection is required.

The instrument includes a surface

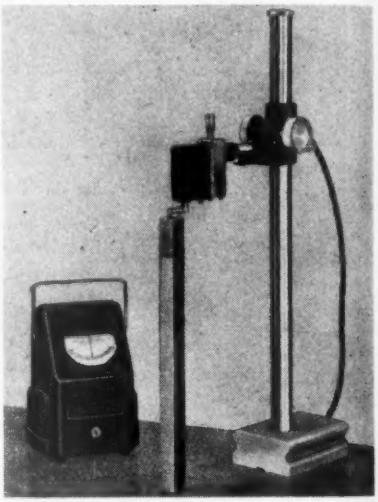

plate block, a 26" column with rack, and a Sheffield Electrigage, 1000:1 amplification, smallest graduation .0001", with electric pickup head mounted on an adjustable extension arm. A micrometer is provided to give $\frac{3}{32}$" vertical adjustment of pickup head, thus allowing the operator a much wider range of rough comparison measurements than is possible with the Electrigage alone.

The mounting bracket is adjustable vertically with a capacity of 0" to 18". The extension arm can be adjusted to bring the pickup head to any location, with a throat capacity (gaging point to edge of column) of 4½" to 11", and gaging point to edge of base, 3½" to 10". The pickup head can be rotated and locked in position around a full range of 360°.

INFORM-A-GRAM KEY No. 24-T

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Trimming formed parts . . . Cutting Sheet Steel, 1-inch Armor Plate, Plastics or what have you . . .

"The process is to some so spectacular that they refuse to believe their own eyes"—so writes the chief tool research engineer for one of the largest aircraft corporations. Previous cutting costs are radically reduced, difficult and slow cutting of certain materials made swift, easy and safe. By all means write for your copy of "FRICTION SAWING" by Arthur A. Schwartz, Chief Tool Research Engineer, Bell Aircraft Corporation which will soon be off the press. It's free.

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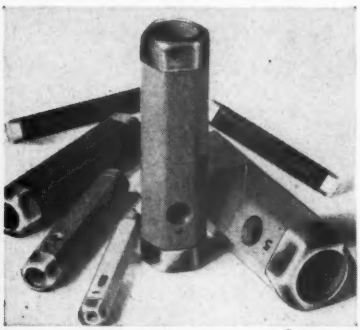
Made of durable plastic material, one-third lighter than aluminum. This lightness permits a most sensitive "touch" with less fatigue . . . an advantage appreciated by women inspectors.



Federal Taperlock Plastic Gage Handles have proved very satisfactory for glass gages. Being so much lighter than metal handles the danger of chipping and breaking is greatly reduced.

Plastic Handles insulate, protecting gages from bodily heat which might affect accuracy.

Easily marked for identification with the same tools used for marking metal handles. Available in SEVEN sizes—00 for small gages, 0, 1, 2, 3, 4 and 5. In FOUR colors — Red, Green, Yellow and Black.

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BURR REMOVAL BY POWER BRUSHING—A report on "Removing Burrs With Power Brushes" containing extensive information on latest advanced techniques, procedures and equipment for such work, has been prepared by the technical department of The Osborn Manufacturing Co., Dept. T, 5401 Hamilton Ave., Cleveland, Ohio.

The report is contained in a 15-page booklet containing 23 illustrations of brushing methods, fixtures and typical brushing applications. A detailed description of different types of industrial brushes and their best applications has been prepared for those interested in the most effective use of this production tool for fast off-hand or automatic operation in removing burrs, scales and for performing similar work. A brief summary chart lists the most commonly used brushes as well as their general applications. The report should prove of considerable value to all metal working plants.

INFORM-A-GRAM KEY No. 417-T

HANDBOOK FOR DRILLERS published by The Cleveland Twist Drill Co., Dept. TJ, 1242 E. 49 St., Cleveland 14, Ohio. The "Handbook for Drillers" is written for the student of drills and drilling. This factual treatise has become so popular and accepted in industry that it is now in its twenty-fourth edition. Rather than a complete treatise on the subject the book is intended as an introduction to the theory underlying the use of the twist drill.

In view of the fact that the handbook is the only work of its kind on twist drills, it is commonly used by colleges, technical and vocational schools both in the United States and abroad, as a textbook. Many thousands of copies, each year, are distributed for educational use, without charge. Instructors are welcome to and will be furnished with as many copies as they can conveniently use. Manufacturers with apprentice schools also find it an excellent manual for their trainees.

Thoroughly covered by many paragraphs devoted to each component are the essential parts of a twist drill. The point in relation to the axis, dead center, heel, the cutting lip angles and clearances and lengths are all portrayed in great detail. The body of the drill and its back taper, clearance, flutes, margin and web are treated equally graphically. Drill speeds and feeds are covered in terms of drill sizes, feed pressure, starting speeds and feeds and performance evidence of too much feed or too much speed is plainly detailed. Many paragraphs are devoted to operative hints pertaining to drilling with automatic machines, drilling various materials, breakage of drills, the proper choice of cutting compounds, the drilling of small holes because of rough holes, the proper way to start a drill and the grinding technique of drill sharpening and web thinning. This highly informative shop manual should be in every machinist's tool box.

INFORM-A-GRAM KEY No. 241.5-T

MO-MAX HIGH SPEED STEELS—Formally titled "The Molybdenum-Tungsten High Speed Steels Marketed Under The General Trade Name Mo-Max" and authored by J. V. Emmons, Metallurgist, and R. G. Kennedy, Jr., Research Metallurgist for The Cleveland Twist Drill Co., Dept. D, Cleveland, O., this booklet covers the history, metallurgy and applications of Mo-Max and constitutes highly informative reading for anyone having to do with high speed steel cutting tool applications. In addition to giving the standard composition of Mo-Max the booklet details the carbon ranges for special purposes. The chapter devoted to Tool Performance covers Mo-Max applications involving drills, reamers, lathe tools, milling cutters, thread rolling dies, form tools, taps, broaches and dies for both hot and cold work. Complete instructions are included for the forging of Mo-Max. The Annealing, Welding and Brazing, Hardening, Quenching and Tempering of Mo-Max are treated in sufficient detail and clarity to enable shop operators to put Mo-Max to work without any

waste motions. There is a table of the Rockwell C hardness of typical Mo-Max High Speed Steels of two carbon contents that shows the effect of varying the hardening and tempering temperatures. Another table gives the analysis of seven comparable types of 18-4-1 and Mo-Max steels. Several pages of text and photomicrographs are devoted to comparisons of the microstructures of Mo-Max and 18-4-1 high speed steels. In conclusion are four pages of graphs covering: Rockwell hardness curves for five representative hardening temperatures; Ultimate Torque curves for five representative hardening temperatures; Stress-strain curves for five representative hardening temperatures and three drawing temperatures; and Plasticity curves for five representative drawing temperatures.

The Mo-Max Manual is in its fourth edition and is available to anyone working with high speed steels.

INFORM-A-GRAM KEY No. 241-T

HOW TO GET TOP PERFORMANCE WITH CARBIDE MANDRELS is related in a new 20-page booklet entitled "Tips for Tube Mills on the Use of Carboloy Mandrels" recently issued by Carboloy Company, Inc., Dept. D, 11109 E. 8 Mile Ave., Detroit 32, Mich., world's largest producers of cemented carbide metal for cutting tools, drawing and forming dies, wear resistant parts, etc. The booklet states that carbide mandrels used on modern tube drawbenches should be given the same care as any other precision tool used in mass production. With these precautions use of carbide mandrels will insure better inside finish, closer tolerances on long runs, more continuous operation, and fewer rejections.

Careful cleaning and pickling is essential to avoid scratches on tubing. A light etch on the tubing holds the lubricant better and provides a good uniform drawing surface. It is important that all tubes remain lubricated throughout the drawing operation. The mandrel will pick up and scratch the tubing if tubes are improperly lubricated. All tubes should be annealed after each pass to obtain greater economies and longer mandrel life. All mandrels should be serviced at regular, predetermined intervals rather than when they "appear" to need servicing.

INFORM-A-GRAM KEY No. 82-T

"QUICK ANALYSIS OF TAPPING TROUBLES"—Printed on a rugged, varnished card stock that will withstand shop wear and tear, Henry P. Boggis & Co., Dept. TJ, 1279 W. Third St., Cleveland 13, O., offers their 4-page Shop Reference List, No. 15, entitled "Quick Analysis of Tapping Troubles." This company manufactures HYBCO tap sharpening equipment.

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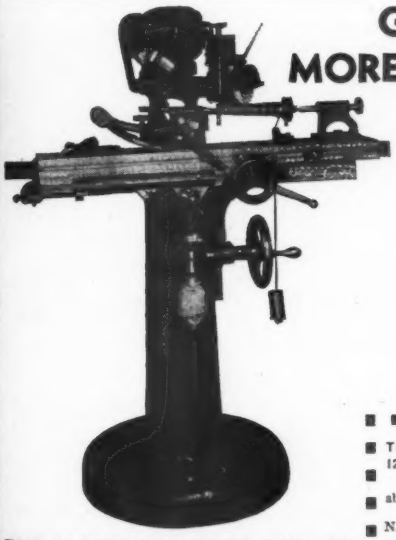

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With more metal left, cutting edges are more adequately supported. Total output per tool is thus increased many times. By this method fewer shutdowns for regrinding are necessary. Each regrind is *better* than the original "factory" grind.

With *one machine*—the Circular Relief Grinder—and in *one* simple operation, tools can be efficiently sharpened. So simply does it operate that even inexperienced men can handle it. Any kind of reamer or tap including Bent Shank Taps of any size can be ground faster and more accurately with it than by hand.

This machine is also used to get a perfect grind on milling cutters, form tools, boring heads, etc., with either straight or spiral flutes. Get further details on the Circular Relief Grinder!

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Please send me Data Sheet F giving full information about the Circular Relief Grinder at no cost whatever.

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1261F West Fourth St. Cleveland, Ohio

Tapping operations involve many variables. The use of a check list for analysis of troubles can save time and material. This list groups related troubles, causes, and suggested remedies together, making determination of procedure quick and easy. Suggestions on the proper care of taps, which can help prevent many usual difficulties, are included in the folder.

Tap sharpening and inspection recommendations and procedures are explained along with a detailed line drawing depicting correct tap terms.

This folder will be sent free of charge in answer to requests made either on company letterheads or via our

INFORM-A-GRAM KEY No. 802-T

WEDDELL NEGATIVE CUTTERS AND FLYWHEEL ARBORS—Because of the great current interest in and high production capabilities of negative angle cutters and flywheel Arbors, new literature prepared by Weddell Tools, Inc., Dept. TJ, Rochester, N. Y., will be of very great interest both to machine operators and production engineers.

One circular covers the Tri-Bit triangular cutter blade and briefly describes its many applications.

The Tri-Bit Hyper Mill specification sheet covers completely their carbide tipped Face Mills, particularly as applied to negative angle cutters.

The use and specifications of Weddell Flywheel Arbors and Adaptors are completely described in the Weddell Circular No. 7. Here is shown how and why coarse blade cutters may be improved in performance by virtue of the flywheel energy stored up in this simple accessory. Sets of this informative shop data are available.

INFORM-A-GRAM KEY No. 804-T

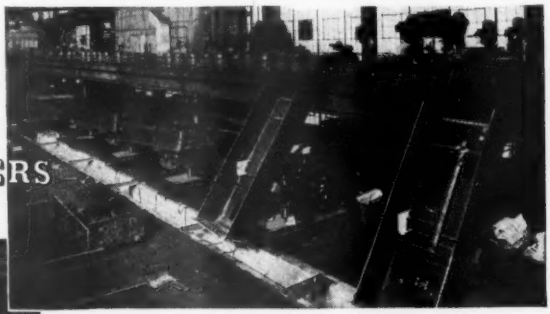
GREENFIELD GUIDE TO SCREW THREAD FITS—A unique 40-page booklet which presents in a concise and graphic manner all of the essential data on screw thread fits has just been published by the Greenfield Tap & Die Corp., Service Literature Dept. J, Greenfield, Mass. A single page of "Guide To Screw Thread Fits" covers all the essential data on one particular size of thread with the corresponding NC and NF data for that size on facing pages. On one page are shown the tap drill sizes, the recommended style of tap to be used to produce various classes of fits, the tap and product limits and tolerances, the thread limits for tap and the limits for threaded products for the various classes of fits. In this way all the information desired by the engineer who has the problem of specifying screw thread data can be quickly found.

The booklet covers NC and NF sizes from No. 3 Machine Screw through 1 inch and also includes several introductory pages covering in non-technical language the general theory of screw thread fits.

INFORM-A-GRAM KEY No. 108-T

C-F

POSITIONERS



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Grinding wet, helps prevent tool tip crazing and flaking, and eliminates heat cracks.

New features of the Hammond 10 and 14: No Spray-No Splash concealed wheel guards provide greater operator freedom and complete visibility of work; Adjustable Coolant spouts swivel in and out with flooding action of the coolant; Safety Cup disc prevents operator from accidental dropping of tool into cup of cup wheel.

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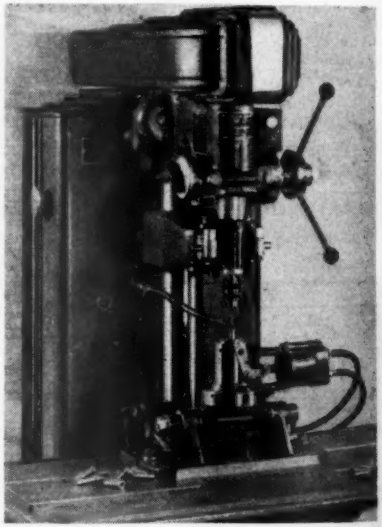
A special mounting by Warner & Swasey tips the fixture about 20° for loading and unloading, thereby saving the time that would be consumed in raising the spindle more than an inch above the work. The operator merely steps on a treadle, which tilts the holding fixture to load. When the treadle is released,



the fixture is returned to the vertical position by means of a spring. A microswitch then starts the operating cycle. When the cycle is completed, the machine stops. Automatic valves at the control box open and close the collet when the fixture is tilted for loading and unloading.

The fixture uses standard 14 AC No. 2 collets. The collet does not move vertically in closing, hence the work can be held to close tolerances in second operations, such as milling slots on a milling machine and other operations. A great variety of air operated holding fixtures are manufactured by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17.

INFORM-A-GRAM KEY No. 650-T

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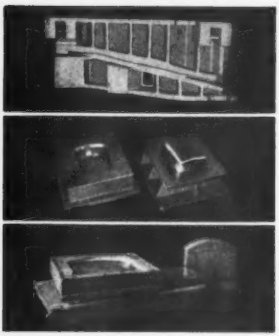

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Because Strenes Metal can be cast to shape—because it usually saves about one-half on machining time—because its self-lubricating properties make for long runs and infrequent redressings—

Because of these and still other advantages, most of our automotive firms, stove manufacturers, refrigerator builders and many more specify Strenes regularly for drawing and forming dies.

Get the facts. They should convince you. Write.

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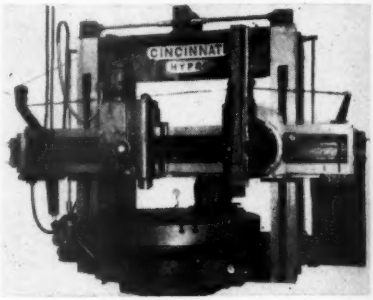
Strenes METAL

Combination Boring and Milling Machine

This machine was designed and built by the Cincinnati Planer Co., Dept. TJ, Cincinnati 9, Ohio, for special jobs on which there was a certain amount of boring and turning and on which, in the same setup, pads or slots had to be milled. This machine saved complicated setups and time.

The bed is of one-piece construction and heavily ribbed. Transmission is



fully anti-friction and all gears are hardened. Flat table tracks are bolted to the bed and the table is centralized and given radial support by a large anti-friction bearing mounted in the center of the table and pre-loaded to allow maximum efficiency.

The table and bed tracks are ample in size and automatically lubricated to stand maximum pressure of high speed boring, turning and milling. There are 16 speeds in geometric progression for the table ranging from 1 to 30 rpm. A low hp motor drives through a worm gear box providing milling feeds of from 2" to 80" per minute. The same transmission is utilized in both table drives.

Feed of the boring head ranges from 1/96 to .8" in 12 mechanical gear changes, also in geometric progression. An individual feed and traverse box is provided for each head. Feed and traverse boxes are fully anti-friction and lubrication is provided by means of a pump built into the box.

The milling head cross feed is obtained through an entirely separate feed unit mounted on the left hand housing.

INFORM-A-GRAM KEY No. 55-T

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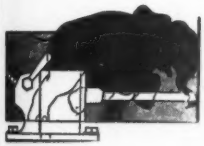

Both models deliver 80 lbs. pressure on a line pressure of 100 lbs. They'll save countless man-hours in assembly operations involving welding, riveting, bolting, etc. *Advantages over mechanical clamps:* **1. Any number can be operated by single master valve. 2. Easily installed in cramped corners. 3. Equal ram pressure at any stroke point. Send for new Mead AIR POWER Catalog, describing our line of Air Clamps, Air Vises, Air Presses, Work Feeders, Valves, Controls, etc.**

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FIREBOX
7¼" high
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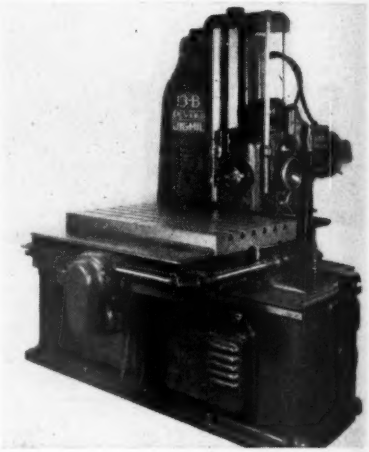
New DeVlieg 3" Bar Jigmil

The DeVlieg Machine Company of Ferndale (Detroit), Mich., announces a new Model 3-B, 3" Bar Jigmil. Somewhat similar to the Model 3-A, this new model embodies some refinements; some range dimensions have been extended and



new important features added, to greatly increase accuracy and speed of manipulation.

One new feature is automatic positioning of the spindle and table from one location to another accurately to within .0001" by precision end measuring rods and push button control, making possible extreme laboratory accuracy, rapidly and with ordinary skill.

Another improvement important to high accuracy is the new type of feather touch controlled pressure locking which firmly locks the slides with a controlled uniformity. This insures the uniform behavior of the oil film and prevents the variable errors of manual locking. All slide and structural elements have been increased in size and length to fully complement the new combination of accuracy control.

The automatic table retraction feature has been improved for greater accuracy. Retraction of table and work from the cutting position is now effected by push button control, which unlocks the table,

A Flexible, Adaptable Tapping Machine!

Handles a Wide Range of Jobs

The Procunier unit here illustrated, by interchanging two tapping heads will handle from a No. 2 tap up to a ¼" tap in steel, ⅜" in cast iron and ½" in brass and aluminum. That means that in your shops one Procunier can do the work of two or more machines.

In addition, all adjustments can be made quickly and easily—such as regulating compensating spring pressure, setting depth stop, changing to any of the four speeds from 390 to 2050 RPM, or adjusting timing or flow of tap lubricant. Extra long compensating springs assure uniform tapping and reversing pressure independent of operator. Tap establishes its own lead for greater accuracy. Automatic tap lubricator provides abundant supply exactly when needed. Many other features.

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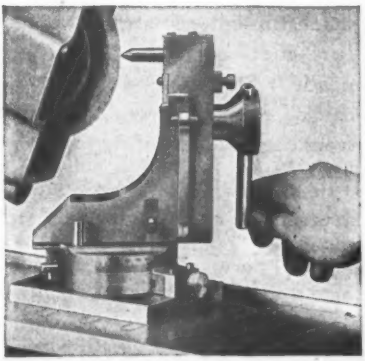

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Large range yet compact
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Measured by the number of times De-Sta-Co Spacers can be used, they are the lowest in cost of any spacers you can buy.

Made of metal, they are not affected by oil or heat.

Use for quick set-up of milling machine cutters and wherever low cost, accurate spacing is needed. Stock sizes .001" to .125" thick. Specials, any length, cut from bar stock, ground to decimal.

TRIAL ASSORTMENT—enough for average use on one machine sent for $1.00. Give arbor size.

Size and price list sent FREE!

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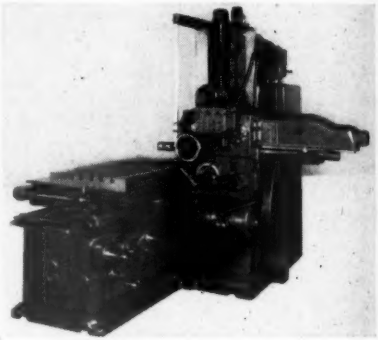
retracts it the desired distance from the cutting position and automatically returns, stopping and locking accurately in the cutting position to within .002". The new finger tip control renders all functions of the machine operative from one position. This control station is mounted on the spindle head and has the advantage of traveling with the



head and the operator for maximum convenience. Standard controls only are used and no electronics are employed.

The spindle is heavier and the spindle head dimensions are increased. The gear train has been improved and all gears are finish shaved for quiet, smooth operation.

There are five motors, as follows: one 3¾-7½ hp, 900-1800 rpm, 2-speed motor for the spindle head drive; one 1 hp, 1200 rpm, motor for the rapid traverse movement to the head and table; one ½ hp, 400-1200 rpm, 2-speed motor for the milling power feeds to the head and table; one ½ hp, 1200 rpm, motor for the automatic retraction for repositioning and locking function of the table; one ⅛ hp, 1200 rpm, motor for the rapid traverse movement of the bar.

All motor mountings are accessible and electrical installation in full compliance with recently established requirements. The machine has 24 spindle speeds from 22 to 1200 rpm. Bar feeds are in thousandths per revolution, from .001" to .016". Milling feeds to the table and the head are in inches per minute selected with a dial quick change mechanism providing a range of .3" to 15" per minute.

INFORM-A-GRAM KEY No. 574-T

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PORTAGE

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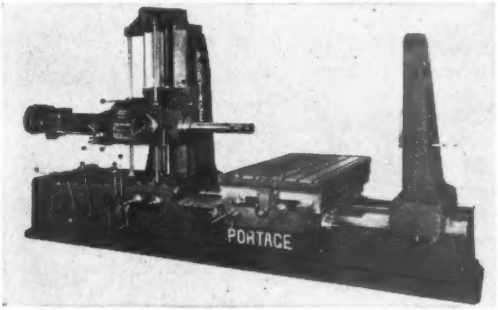
ROTARY TABLES



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Barker Wrenchless Two-Jaw Chuck

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The experience of this user is typical of the reports from hundreds of manufacturers who are operating Barker Wrenchless Chucks—substantial dividends in more parts per hour, and lower cost per part.

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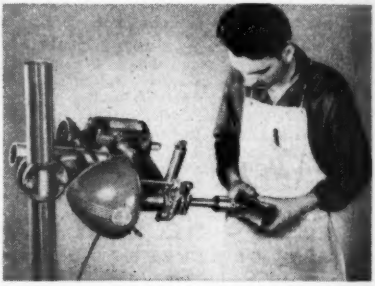
Drill Press + Bracket = All-Purpose Machine

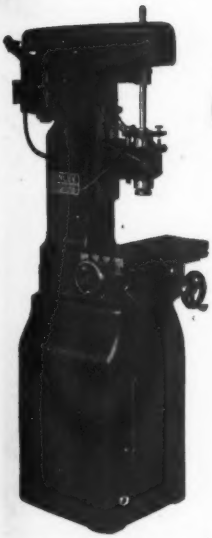
Just announced by the Nobur Manufacturing Co., Dept. T, 910 N. Orange Dr., Los Angeles, Calif., is a new Angle Bracket that will convert any drill into one of the handiest and most versatile of shop machines.

This new angle bracket instantly changes a drill press into an all-purpose machine for angle drilling, polishing, buffing, sanding, rotary filing, wire



brushing, tapping, reaming, burring, grinding, honing as well as for many more specialized and varied uses.

As evidenced by the setup illustrated, the angle bracket is a quick and inexpensive answer to the hundreds of tedious jobs that demand speed and efficiency. The spindle can be adjusted to any height, placed horizontally or vertically, or at any angle, and hence can be positioned for optimum convenience and operator comfort. It fits the machine to



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. . . The 8 spindle speeds to 4250 r.p.m.; its rigid and compact construction, fast set-up and quick changeover, velvet feed and precision production . . . warrant consideration by any shop . . . insure time saving and definite cost reductions.

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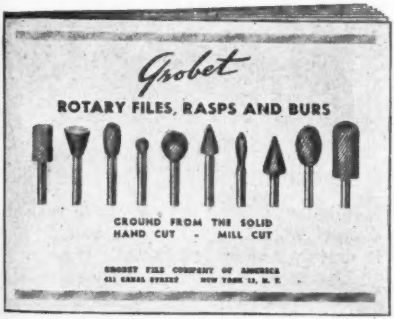

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"Tool Steel Tubing Applications" describes seven specific cases in which tool steel tubing was used to save time, money, manpower and metal. There may be similar cases in your plant — or others of a different nature—where BISCO tubing can cut machining to a minimum. Write TODAY for your free copy of this interesting story.

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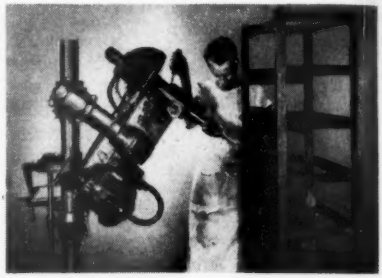
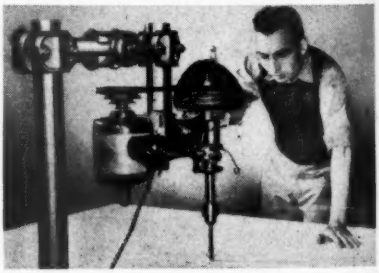
the work. Two adaptors can be combined to greatly extend the range and flexibility of a drill press.

This new Nobur Angle Adaptor is rigidly constructed, sturdily built, and has positive locking. A simple turn of a wrench is all that is necessary for positioning. Available for all popular



models of drill presses whose construction embodies a round column, the adaptor is easily installed simply by removing the spindle head from the main column and securing the open V-type end of the adaptor to the column. Then the spindle head is clamped on the short



tubular column which is furnished as part of the adaptor assembly. Immediately available for drill presses with 2¾" to 3½" columns. Illustrated literature is available.

INFORM-A-GRAM KEY No. 164-T

★

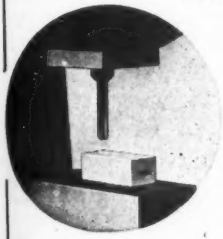
New Patents of Tooling Interest

(for obtaining, see page 156)

FEED SCREW MECHANISM, No. 2,345,194.
EXPANSIBLE MANDREL, No. 2,345,246.
POWER-DRIVEN HACK SAW MACHINE, No. 2,345,261.
GEAR CHECKING APPARATUS, No. 2,345,298.
VISE, No. 2,345,708.
TOOL JOINT WITH DOUBLE TAPERED SOCKET, No. 2,345,725.
GAUGE HANDLE, No. 2,345,749.

NEW **Anti-Wear ANVIL BLOCKS**

MAKE COMPARATOR ANVILS LAST LONGER!



$4.50 each

Standard Anvil Blocks are extremely low in cost, and have a trade-in value of $1.00 each when worn. Immediate delivery.

Why wear out costly measuring instrument anvils, when you can keep them like new indefinitely by using low-cost *Anti-Wear* Anvil Blocks. Simply wring the Block to any flat anvil (serrated or plain), and it will adhere firmly. The work will rest on the Block to eliminate wear of the instrument anvil.

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Acme *Anti-Wear* Anvil Blocks are lapped flat and parallel on all four sides to within a few millionths of an inch. Are made of hardened and seasoned gage block steel for long service. Standard size Blocks are ½" wide, ½" high, 1⅜" long.

Bear in mind . . . these Blocks are in everyday service in our own shop and have proved of great value to us. Take advantage of our experience and equip with *Anti-Wear* Anvil Blocks now. Order today.

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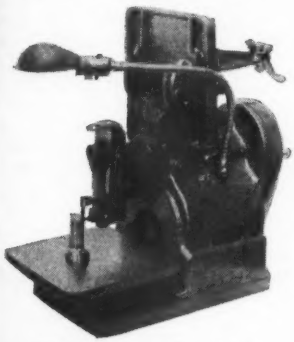
FLANGED PUNCHES - BLIND CAVITIES - MOULDS - DIES

Uses a controlled downward movement with an adjustable stroke.



DIES filed on upper table when swung down.

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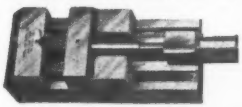
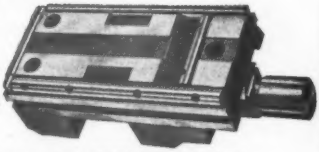
SINE VISES *Master Gage Builders!*

For SURFACE GRINDING, LAYOUT, INSPECTION OF GAGES, TOOLS, AND FINE INSTRUMENTS



No. 2 (Sine of 5") TILTS ONE WAY as Sine Bar. Opens Three Inches Size, 6"x2½"x2¼"

No. 3 TILTS THREE WAYS Sine of 6" & 3" Size 7½"x3½"x2¾" Opens 3½"



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Features Include:

1. Precision Sine Rolls
2. Non-Projecting, fully covered, Telescoping Screw
3. Removable Grip Screw Knob
4. Prismatic Slide Jaw
5. Accurate Integral V-Block
6. Tolerance .0002"

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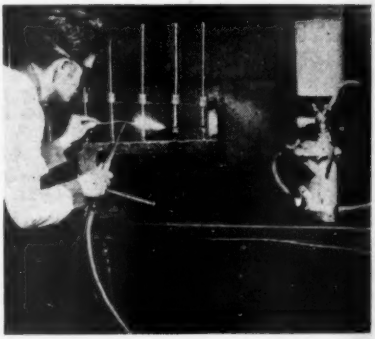
Major diameters are relieved on Republic rings, affording many economical re-lappings and re-settings on each ring.

Gasflux Process for Silver Soldering

Development of a new technique for the application of silver solder and other low melting point alloys in production is announced by C. A. Medsker, Chief Engineer, The Gasflux Company, Mansfield, Ohio.

Mr. Medsker says that the method has practically eliminated the principal non-productive finishing operations that have been commonplace procedures in numerous plants. The basis of the improvement is the automatic supply of



flux to the joint in the correct amount and at a uniform rate.

Proper fluxing of the joint is more than incidental to the silver soldering process. It performs the vital function of dissolving and removing oxides and other impurities, and of inducing a rapid flow of the solder through the joint. Since failure to use sufficient flux inevitably results in a sub-standard joint, the tendency is to use more than enough flux in order to be on the safe side. This is especially true of operators who have not had long experience with the process, and the war emergency has made it necessary to employ many after only a brief period of training.

Under these conditions two difficulties have been encountered, both of which are detrimental to the production rate. First is the discoloration and the accumulation of residue when excess flux

1/6 H.P.
35,000 R.P.M.
UNDER LOAD

WEIGHS
35 OZ.

MORE POWER LESS WEIGHT

Twice the power and twice the speed of any other electric handtool! Use for faster, smoother grinding, milling, deburring, and finishing of steel, nonferrous metals, plastics, and most other materials. Speeds up to 35,000 r.p.m. under load reduce frictional wear on mounted wheels by as much as 200%.

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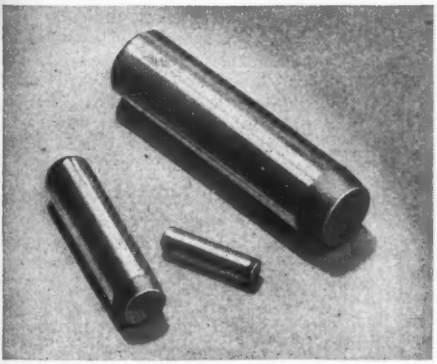

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DOWEL PINS

While commonly used in punch and die work, our dowel pins are also serving as locating pins and for many newly recognized purposes of convenience in machine assembly. Surfaces are precision-ground to a tolerance of plus or minus .0001" and treated with rust preventive. Our standard pins are ground .0002" over listed diameters; oversize pins are ground .001" over listed diameters. Supplied in 38 lengths from 5/8" to 6" and in diameters from 1/8" to 1".

We can fill your order immediately from stock in most any size and quantity. Let us have *your* order today.

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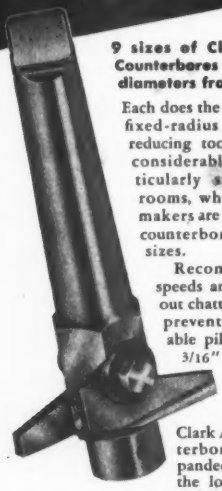
WHY USE 63 WHEN 9 WILL DO?



9 sizes of Clark Adjustable Counterbores cut all fractional diameters from ¼" to 5½".

Each does the work of 7 or more fixed-radius cutters, thereby reducing tool inventory costs considerably. They are particularly suitable for tool rooms, where tool and die makers are constantly needing counterbores of different sizes.

Recommended surface speeds are faster, and without chatter. Exclusive, burr-preventing interchangeable pilots available from 3/16" up, by sixteenths.

Clark Adjustable Counterbores are easily expanded. Simply loosen the locking bolts and slide cutting blades in or out. Blades are removable for sharpening.

No de-burring of pilot holes necessary.

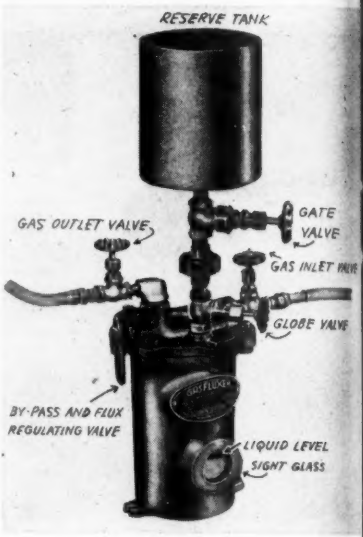
Clark Counterbores spot face as well as bore.

Write for bulletin TDJ-1 and call your Clark Cutter Jobber today.

CLARK CUTTERS

Robert H. Clark Company

9330 SANTA MONICA BOULEVARD · BEVERLY HILLS, CALIFORNIA



is used. This means a special cleaning operation (usually washing with hot water followed by electrolytic cleaning or pickling), followed by grinding and buffing to remove all traces of the glassy residue. The second difficulty is the formation of porosities by the gases emanating from the volatilized flux. Where gas-tight joints are specified these porosities are usually discovered by prevailing inspection methods and the rejected parts have either to be reworked or discarded.

Some studies that were made of large-scale silver solder operations in war production plants pointed to improper application of flux in paste form as the probable cause of these difficulties. Experiments were then conducted to develop procedures for using the automatic Gasflux process, which has been used successfully for several years for brazing and bronze welding operations. With a very little modification to accommodate local plant conditions these procedures are now being widely applied in practice.

In general, the Gasflux process does away with the conventional method of either dipping the filler rod into the flux or applying the flux to the work

NUMBERALL

GUIDE AND SPACING BLOCK

Assures correct alignment and spacing of characters when stamping details in nameplates. By placing the Numberall stamping machine in the slot which has a graduated guide, and simply moving the stamp forward, following each numeral on slot as a guide, a very neat stamping job will be obtained. Block is of hardened steel.

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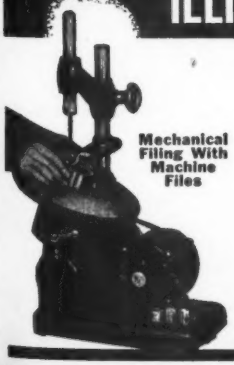
HUGUENOT PARK STATEN ISLAND 12, N. Y.

ILLINOIS DIE FILING MACHINE



Reduce costs and improve quality with this TRIPLE-PURPOSE Machine

A versatile bench type machine for all three major production steps in the die-making process—sawing, filing and stoning. Quality built throughout to stand up longer and produce more accurate work. Forced-feed lubrication plus hardened and ground shafts running in bronze bushings combine to minimize wear and prolong life. Maintained accuracy is secured through holding chuck and clamping device which provide positive file alignment, and balanced moving parts which operate without vibration. *Write for descriptive literature.*

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NEW Angle Adaptor

Converts any drill press into a versatile multi-purpose machine.

Permits any spindle angle . . . at any height . . . horizontally or vertically.

Simplifies clumsy operations . . . speeds production . . . eliminates operator fatigue.

Makes burring, sanding, buffing, grinding, angle drilling, polishing, rotary filing, wire brushing, tapping, reaming, honing, etc., more convenient, twice as fast!

Adaptable to all drill presses with tubular columns . . . rigid construction . . . POSITIVE LOCKING. Write now for descriptive literature, details.

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908 North Orange Drive
Los Angeles 38, California

with a brush. Gasflux consists of properly compounded fluxing ingredients carried in solution in a highly volatile and inflammable liquid which evaporates rapidly when exposed to the air.

The equipment consists of a container called a Gasfluxer, which is introduced into the fuel gas line supplying the torch. The head of this container has a cylindrical flux regulating and by-pass valve which permits operation with any desired amount of flux or with no flux if used as a complete by-pass. The interior contains a cotton wick or filter which is kept saturated with the liquid. After turning on the fuel gas and opening the torch valve to allow all the air to be expelled from the system, it is ready to operate. The fuel gas passing through the Gasfluxer picks up the flux in vapor form and delivers it to the torch. The flux is in the flame, instead of on the rod or on the work, and the proper amount to use can be secured by adjusting the flux regulating valve. The fuel gas may be acetylene, city gas, or any other gas that is suitable for the conditions of the work; and no change needs to be made in either torches or tips. A reserve tank of one gallon capacity is attached to the Gasfluxer for convenience in refilling without stopping operations, and a sight glass on the bottom part of the container body provides for observation of the liquid level.

No changes in fixtures or assembly procedures are necessary. The new procedure is recommended for use on any silver solder job where it is necessary to clean after completing the joint or where pinholes or porosity are giving trouble.

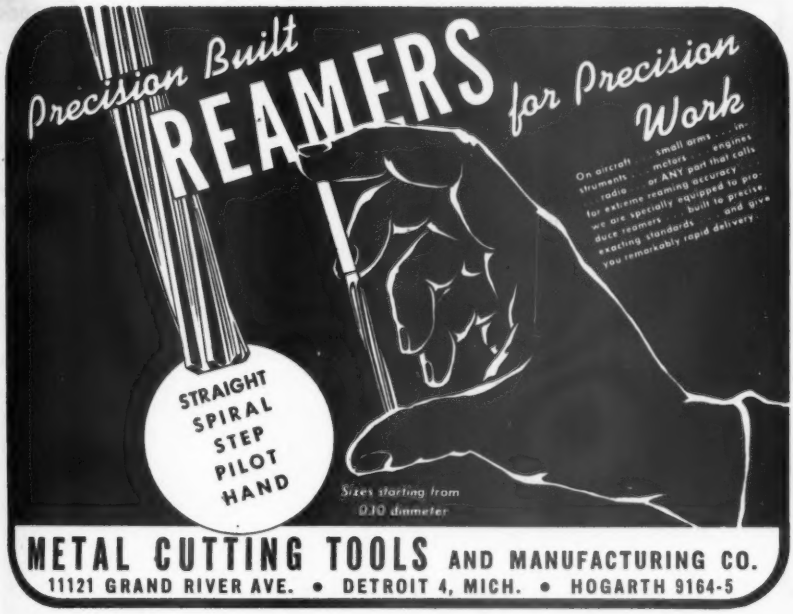
INFORM-A-GRAM KEY No. C57-T

★

New Patents of Tooling Interest

(for obtaining, see page 156)

LAPPING APPARATUS, No. 2,345,308.
RADIAL PRECISION TAPPING MACHINE, No. 2,345,318.
SPROCKET GEAR AND METHOD OF MAKING THE SAME, No. 2,345,343.
METHOD OF REAMING VALVE SEATS, No. 2,345,349.
DRAW PRESS, No. 2,345,353.
SCRIBING TOOL, No. 2,345,367.
PNEUMATIC OR HYDRAULIC VISE, No. 2,345,401.
CUTTING TOOL HOLDER, No. 2,345,462.
CHUCK, No. 2,345,495.
MACHINE TOOL, No. 2,345,581.
MICROMETER MASTER GAUGE, No. 2,345,591.
LATHE ATTACHMENT, No. 2,345,613.
SCREW AND SIMILAR MACHINE, No. 2,345,686.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On aircraft ... small arms ... instruments ... motors ... engines ... radio ... or ANY part that calls for extreme reaming accuracy ... we are specially equipped to produce reamers ... built to precise, exacting standards ... and give you remarkably rapid delivery.
STRAIGHT
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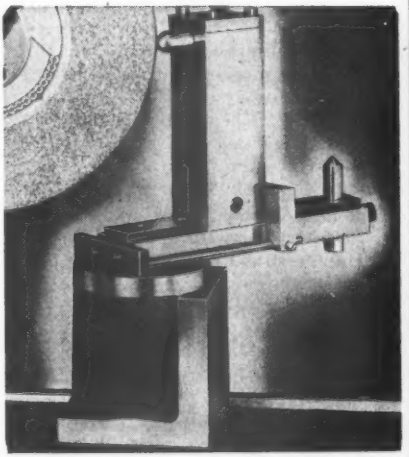

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Large range.
Chatterless and dustproof.
.0001" accuracy obtainable.
Simple to operate.
Reasonably priced.

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One Reason Why—

PLASTICS MOLDS

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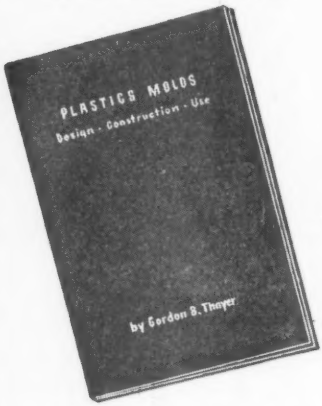
Second Edition

By Gordon B. Thayer



is already selling in its third reprint . . . "tool design and construction are 90 percent and material molding technique 10 percent of successful plastic molding" — a statement of a district manager of a leading material manufacturer.

"Plastics Molds", written by a practical shop trained man, is the "know-how" book that every designer in the plastics field will eventually buy.

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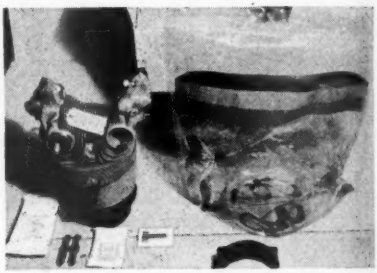
AMERICAN INDUSTRIAL PUBLISHERS

302 Fairmount-Cedar Building

Cleveland 6, Ohio

Pliofilm Packaging Speeds Warplane Repairs

Replacement cylinders for warplane engines are now being packaged in Pliofilm, the Goodyear Tire & Rubber Company's rubber hydrochloride packaging film. For some time Pliofilm has been used for the packaging of warplane engines for shipment or storage, but it has been recently disclosed that Pliofilm is now being used to give the same moisture protection to replacement parts. "Run in" replacement cylinders, for example, are being shipped to battlefronts over the world from at least one manufacturing plant, with Pliofilm packaging.



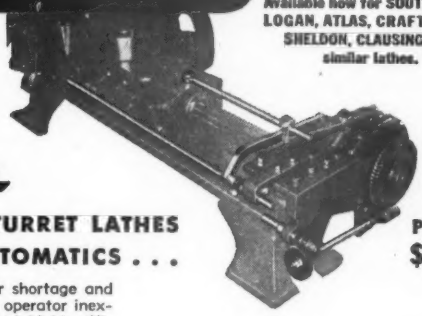
The Ford Motor Company in Kansas City, Kans., is heat-sealing spare airplane engine cylinders in Pliofilm containers. Before sealing, part of the air inside is exhausted by vacuum. Bags of silica gel, absorb whatever moisture remains. In addition, each "run in" cylinder package includes an indicator card visible through the Pliofilm to show at a glance when moisture inside the package has risen beyond the danger point.

As with the larger packages for warplane engines, the Pliofilm replacement or spare cylinder package can be opened quickly and easily for replacement of the silica gel, then resealed again.

With use of Pliofilm for the spare and replacement cylinders, these parts can be installed in the engines after removing the Pliofilm wrappers with every assurance that the same tolerances and adjustments will still exist as when the cylinder left its assembly line and test block.

INFORM-A-GRAM KEY No. A35-T

Newton AUTOMAT



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Converts

HAND-OPERATED TURRET LATHES INTO RELIABLE AUTOMATICS . . .

PRICE $295

HERE is relief from manpower shortage and losses from rejects incurred by operator inexperience and fatigue—a practical, highly efficient means of greatly increasing output and profits, easily installed on any bench lathe. The unit is very simple in design and of rugged, enduring construction—as foolproof as a mechanical device can be. The set of standard cams will handle almost any job. The member which actuates the cross slide is a torque rod which cushions the shock of forming and cut-off operations, assures uniform feed and accurate repeating, prolongs tool life. An automatic cut-out, quickly adjustable to work of different character, reduces tool spoilage and parts rejection. A Schrader-engineered three-way valve operates any collet closer. Put this easily installed, money-making unit to work for you now. It will pay its cost in less than 30 days!

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The KNURLED SOCKET HEAD

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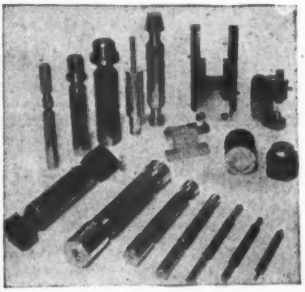
- Ring-Flush Pins—Flat, Solid and Built-Up Snaps.
- Thread Plug and Ring Gauges.
- Adjustable Limit Snap Gauges.
- Special Gauges, Small Fixtures.
- Complete Sets of Gauges for Fuse and Shell Work—Artillery, Small Arms, Aircraft, and Chemical Warfare.



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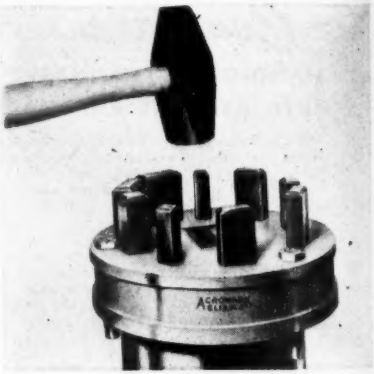
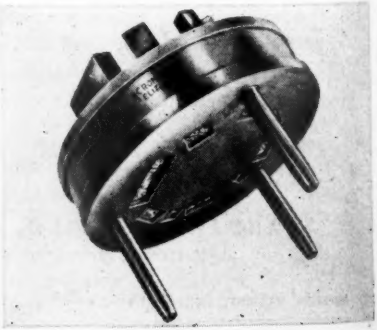
Acromark New Style Marking Die Holder

To facilitate the marking of all types of ordnance and automotive parts too large to be handled in power-operated marking equipment, The Acromark Company announces a new style mark-



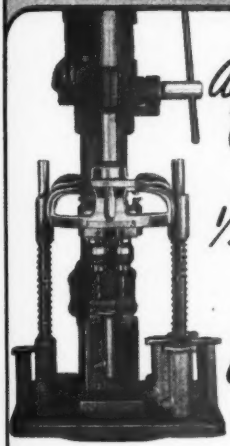
ing die holder—a compact self-contained unit which holds all marking dies in exact position ready for stamping.

The face of each marking die is protected in the holder so that it may be quickly placed in marking position without danger of scratching the work. Each die is properly balanced and has the marking arranged so that an impression can be made by a single hammer blow on each die, and each die is supported in such a manner that "bounce or chatter



TWO SPINDLE *Adjustable* DRILL HEADS

Drill Two Holes At Once



✓ *Adjustable Centers from 1/2" to 6"*

✓ *Drill Capacity 0 to 5/8"*

Sleeve and overarm types ... in several sizes. Will double output of any single spindle drill press.

Quickly adjusted to desired drill centers from 1/2" to 6".

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Speed up accurate alignment and machine work with these handy blocks.

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THE CHALLENGE MACHINERY CO.

GRAND HAVEN MICHIGAN

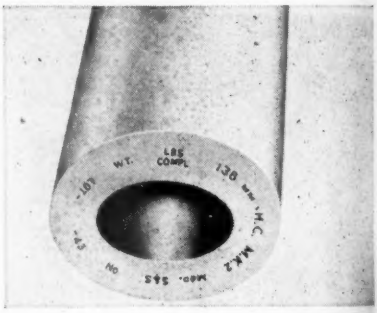
marks" are practically eliminated.

Individual sections of the marking may be changed as required—it is not necessary to scrap the entire setup or die. Marking cannot be placed in wrong position or inverted after holder is set in place.

ANGLES
"TO A MINUTE IN A MINUTE!"
THE BEMISINE
SPEEDS UP AND SIMPLIFIES SETTING ANY ANGLE FROM 0 TO 90° — USING ONLY A 2" MICROMETER! *IT HOLDS THE WORK! FASTER THAN A SINE BAR OR PROTRACTOR! CONVERTS SET-UP TIME TO PRODUCTION TIME ON SURFACE GRINDERS, JIG BORERS AND MILLERS.
*Also Used With Standard Gage Blocks

The new style die holder is particularly suitable for use where a limited number of parts are to be marked and an expensive power setup is not warranted. Large shells, cannon and large rifle barrels fall into this category.

Poor marking is overcome by the fixture illustrated. It holds the entire set of stamps in the exact position required. Its design can be altered to fit special parts and guide pins and bars may be placed as required. When marking, the entire fixture is placed over the part and each stamp is hit in rapid succession with a suitable hammer. This marking can be done as fast as a man can wield a hammer and there is no chance for the mark to be misplaced, or inverted. Since the stamps are squarely held, a perfect mark will result even with an inexperienced operator.



For details concerning proposed applications, inquiries should be addressed to the Engineering Department, The Acromark Company, 5-15 Morrell St., Elizabeth 4, New Jersey.

INFORM-A-GRAM KEY No. 636-T

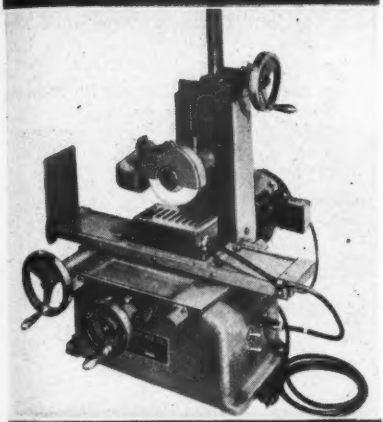
★

New Patents of Tooling Interest

(for obtaining, see page 156)

GAUGE, No. 2,345,750.
RADIUS AND TANGENTIAL SURFACE GRINDING WHEEL DRESSER, No. 2,345,821.
DIAL TEST INDICATOR, No. 2,345,845.
STRIPPER FOR SHELL DRAWING DIES, No. 2,345,857.
GAUGING DEVICE, No. 2,345,867.
CYLINDER GRINDING TOOL, No. 2,345,930.
CUTTER MANUFACTURE, No. 2,345,986.
VARIABLE SPEED BELT DRIVE, No. 2,346,028.
VERNIER HEIGHT GAUGE, No. 2,346,063.
TOOL, No. 2,346,084.
TAP AND REAMER WRENCH, No. 2,346,097.
HYDRAULIC PRESS CONTROL, No. 2,346,141.
PERMANENT MAGNET CHUCK, No. 2,346,193.
DRILLING MACHINE, No. 2,346,198.

SANFORD



High-Speed BENCH SURFACE GRINDER

ACCURATE WITHIN .0001

A sensitive machine built to rigid standards of accuracy and workmanship specially designed *"For the job that fits in your palm."*

PROMPT DELIVERY

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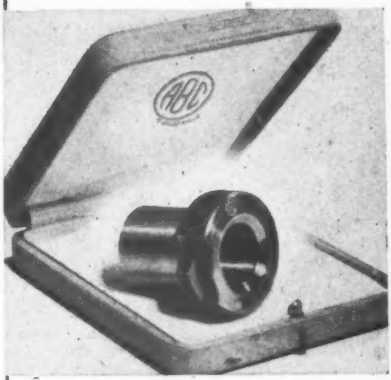
Available On M. R. O. Certifications

SANFORD MFG. CO.
1279-81 Springfield Ave.
Irvington II, N. J.

JEWELS OF PRECISION



A. S. A. STANDARD DRILL JIG BUSHINGS

Prompt Delivery from Stock

- **HEADLESS PRESS FIT**
- **HEAD PRESS FIT**
- **FIXED RENEWABLE**
- **SLIP RENEWABLE**
- **HEADLESS LINERS**

also
SCREWS • CLAMPS
LOCATING JIGS

Send for New Catalog No. 243

ACCURATE BUSHING COMPANY
447 NORTH AVE., GARWOOD, N. J.

"10 MILLION PIECES without a single rejection, thanks to MICRO-CHEK" -says LUCAS SCREW PRODUCTS, Inc.

Users of nearly 100 Trico MICRO-CHEKS, Lucas Screw Products, Inc., of Rochester, N. Y., reports:

"We find them to be a low-cost economical way of controlling accuracy on high precision automatic screw machine production. In numerous cases, we have reduced our gage cost from 50 to 75 per cent. They check close tolerances . . . eliminating fatigue and uncertainty upon the operator. Their simplicity enables us to use inexperienced help in final inspection. In one case we produced 10,000,000 pieces without a single rejection from the prime contractor."

Speed inspections in YOUR plant with TRICO MICRO-CHEK Comparator Gages, now in use in more than 3600 war plants . . . on machines, on inspection lines. Send for booklet which illustrates many applications.

TRICO MICRO-CHEK
TRICO PRODUCTS CORP.
40 Trico Square, Buffalo 3, N. Y.

Simplified Withholding Tax Chart

To assist office managers in handling payroll deductions with speed and accuracy under the new Withholding Tax Law, the new Delbridge Simplified Tax Chart has been published by the Delbridge Calculating Systems, Inc.

The revised Tax Law which becomes

effective January 1 is such that the Delbridge chart will prove invaluable to office managers. It is published in four editions covering weekly, bi-weekly, semi-monthly and monthly payroll periods. Each edition also shows daily and monthly payroll deductions for periods from 1 to 6 days inclusive. The chart also covers the 18 and 22.5 percent rates.

The Delbridge organization has been specialized publishers in the calculating tables field since 1890. Additional information can be obtained by writing to the company at 2502-10 Sutton Avenue, St. Louis 17, Mo.

INFORM-A-GRAM KEY No. C53-T

★

New Patents of Tooling Interest

(for obtaining, see page 156)

MEANS FOR REDUCING THE DWELL IN HYDRAULIC PRESSES, No. 2,346,212.
SHEET METAL STRETCHING PRESS, No. 2,346,213.
PLATEN CONTROL DEVICE, No. 2,346,214.
GEAR CROWNING, No. 2,346,266.
MILLING CUTTER, No. 2,346,343.
TOOL FEEDING MECHANISM, No. 2,346,359.
GAUGE, No. 2,346,406.
APPARATUS FOR DETWISTING METAL SECTIONS, No. 2,346,438.
ENGRAVING TOOL, No. 2,346,474.

BURKE

MILLING MACHINES

No. 4 Motor Driven MILLING MACHINE
Mounted on Cabinet Column

Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

Burke Machine Tool Co.
301 E. 16th St. -:- Conneaut, Ohio

Reg. U.S. HY-PRO Pat. Off.

TAPS

These high production taps produce consistently more accurately threaded pieces to lower the cost of your tapping operations.

Precision ground from the hardened solid of high speed steel, HY-PRO tap tolerances are held to extremely close limits. *Accurate tapping assures tighter, stronger fastenings that defy vibration!* Specify HY-PRO for High Production.

Commercial and Precision Ground Thread Taps

•

Special Ground Thread Taps

Write for Catalog on Company Letterhead

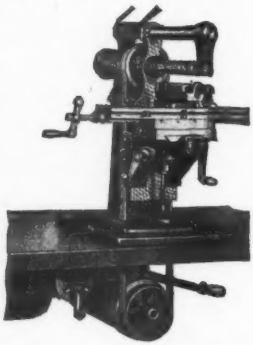
HY-PRO TOOL CO.
New Bedford. Mass. U.S.A.
489 Mt. Pleasant St. BUY BONDS

Integral Drive. Nothing under bench. Infinite, variable speeds.

¾" and 1" collet capacity, 9" swing.

For best toolroom accuracy, also fast precision manufacturing.

Stark Open Cone Lathes
¼", ½", ¾" and 1"
With 9 Speed Motor Drive Unit



Plain Precision Bench Millers with best indexing

Table 18" x 4", Feeds 10"

Transverse 3½", Vertical 7"

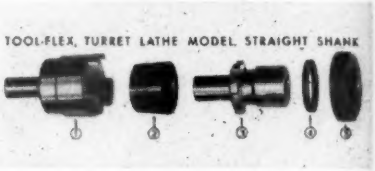
STARK TOOL COMPANY
Waltham (1862) Mass.

Originators of the American Bench Lathe

Flexible Tool Holder

A new flexible tool holder, Tool-Flex, is announced by Richmont, Inc., 215 W. Seventh St., Los Angles 14, Calif.

In place of a complicated mechanism, Tool-Flex utilizes a simple, inexpensive, oil-resistant Neoprene rubber insert as the "universal joint" by which the tool floats. This construction is the essence



of simplicity, as shown in the exploded view of the turret lathe model with straight shank, consisting of only five parts: (1) body or shank; (2) rubber insert; (3) holder; (4) rubber grommet; (5) retainer cap. Other Tool-Flex types dispense with the grommet—have only four parts.

Tool-Flex is designed specifically as a follow-up tool. It compensates for both parallel and angular misalignment of turret head or tail stock with the lathe spindle. It permits reamer, counterbore or hone to follow and, by relieving side pressure, prevents bell-mouthing, oversize holes and tool marks; it reduces wear on tool and jig bushings, hence produces more accurate close tolerance work. The specially compounded Neoprene rubber insert, by absorbing shocks in such operations as tapping and portable tool drilling, greatly reduces tool breakage. Vibration in jigs is practically eliminated. Flexibility is uniform, so that the concentricity of the entire tool is maintained for precision work. Flexibility is readily adjustable; tightening or loosening the retainer cap increases or decreases the counter-action of the rubber insert to compensate for varying degrees of misalignment or character of work.

Tool-Flex tool holders are available with straight shanks ½" to 2", female taper 2-A or 33 for drill press spindles, and Morse taper shanks No. 2, 3 and 4.

INFORM-A-GRAM KEY No. C52-T

TOOL & DIE JOURNAL

Know-How Library

THE Tool & Die Journal Know-How Library is a series of manuals being prepared by specialists having the practical, shop know-how in their respective fields.

Metal working processes, techniques and materials including plastics, will be treated comprehensively and authoratively.

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A concise introduction to the leading plastics materials, molding and fabricating methods. Already in use in training programs and sales engineering conferences.

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They will greatly simplify your Tool and Die program. They will speed up those many die jobs. They save 50 to 60% of the labor as compared to hand methods and permit the use of less skilled mechanics.

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Avoid cheap substitutes — buy the Original Oliver — a tried and proven tool—over 25 years of satisfactory service to thousands of users. Excellent delivery.

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Send for complete literature today—put this machine to work — you will find it to be the busiest tool in your shop. Model S-1 illustrated.

We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders, Point Thinners

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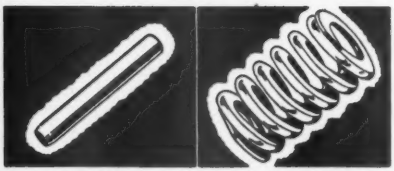
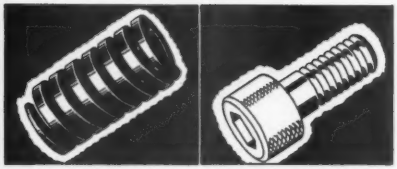
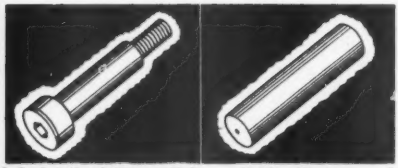
DIE MAKERS' ACCESSORIES



Dowel Pin | Oval Wire Spring



Square Wire Spring | Socket Head Cap Screw



Socket Head Stripper Bolt | Rubber Bumper

For quick service you can purchase these necessary items for immediate delivery from the following offices and stock rooms:

The Producto Machine Company
990 Housatonic Ave., Bridgeport 1, Conn.
The Producto Machine Company
197 Lafayette St., New York, New York
The Producto Corporation
3017 Medbury Ave., Detroit 11, Mich.
The Producto Company, Inc.
139-141 West 16th St., Indianapolis 2, Ind.
Jamison Steel Corporation
2168 E. Olympic Blvd., Los Angeles 21, Cal.
Jamison Steel Corporation
506 Fourth St., San Francisco 7, Cal.
Valentine Sales Company
1926 S. Malvern Ave., Dayton, Ohio

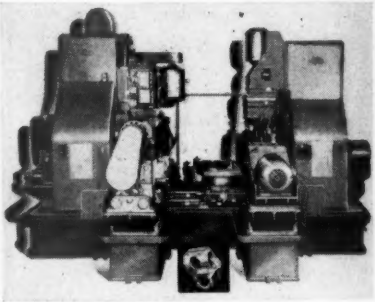
Producto Service on Die Sets and Die Makers' Accessories is nation wide. Contact nearest office and stock room.

THE PRODUCTO MACHINE CO.
BRIDGEPORT 1 • CONNECTICUT

Eight-Way Drilling and Tapping Machine

This large special-purpose machine, designed and built by Snyder Tool & Engineering Company, 3400 E. Lafayette, Detroit 7, Mich., demonstrates the practicality of combining multiple drilling and multiple tapping in a production operation.

The machine is built in two sections,



one side being used for drilling, the other for tapping. In the center position, between the two work stations, the part is loaded and clamped in a locating fixture mounted on an index table for 180° index. This rotary table is installed upon a fixture carriage which is ball bearing mounted and moves upon two hardened and ground round rails. The loaded part is rolled into position at the left section of the machine where the fixture assembly is located and held in place on the rails. Two index pins position the fixture and carriage assembly in preparation for the drilling cycle.

The multiple heads and bushing plates for drilling the various flanges in the part are mounted on Snyder self-contained, hydraulic guide bar units and all four heads are interchangeable with other heads having various numbers of spindles, set in various positions. When the part is drilled it is returned to center position, indexed 180° and rolled into the right hand section where all drilled holes are tapped.

Automatic work cycle provides rapid tool advance, feed to required depth and rapid retraction.

INFORM-A-GRAM KEY No. 466-T

New Patents of Tooling Interest

(for obtaining, see page 156)

STOP DEVICE FOR THREADING, ROLLING, AND OTHER MACHINES, No. 2,346,516.
DRESSING DEVICE FOR GRINDING WHEELS, No. 2,346,528.
DEEP HOLE DRILL, No. 2,346,546.
DIAL INDICATOR, No. 2,346,578.

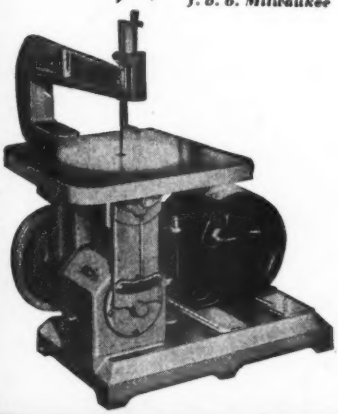
ATLAS DIE FILER

This sturdy and well designed bench type machine, for rapid and accurate die filing and sawing, will eliminate many costly hand operations.

Complete with motor and saw attachment at

$125.00

f. o. b. Milwaukee



Milwaukee Chaplet and Mfg. Co.
1023 S. 40th St. • MILWAUKEE, WIS.

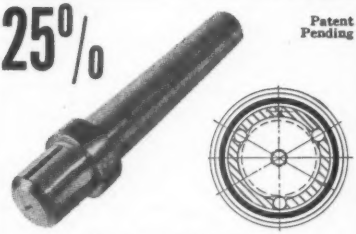
Grand Rapids No. 60 Universal Cutter & Tool Grinders feature cabinet base, ball bearing table and fixed table height, backed by 35 years of know how.

Bulletin on request

GALLMEYER & LIVINGSTON CO.
304 Straight Ave., SW
GRAND RAPIDS (4) MICHIGAN

25%

Patent Pending



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"Roller Clutch Expansion"

Boost your high production 25%. This self contained unit requires no wrenches, "C" washers or power operated draw bars. Work locks automatically when placed on the mandrel. Work will not slip or jam. Young Mandrels require no adjustments.

Concentricity is maintained in LOW TENTHS for entire work length. Interchangeable sleeves reduce tool costs. No more obsolete mandrels.

Use Young Mandrels for grinding, turning, polishing, etc.

Quotations made from your detailed sketches of part and present mandrel. Good delivery schedules.

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WORK
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Keep hands
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Tubular FEATHER TOUCH
SNAP GAGES

EASY to USE TU-MI-CO TUBULAR FRAME of special homogeneous grain structure steel is 25 to 50% lighter than solid frame—yet highly shock resistant. Lessens fatigue. Hermetically sealed, low thermal conductivity, less expansion. Triple plated—copper, nickel and chrome, buffed and polished—an attractive, high quality precision tool. Prompt delivery.

TUBULAR MICROMETER CO.
ST. JAMES, MINN., U.S.A.

Norflex Polishing Wheels

The Norton Company, Dept. D, Worcester, Mass., announces a new line of NORFLEX solid polishing wheels, available in three types: cork resinoid, fiber resinoid and resilient rubber. Together, they meet the special requirements of a wide range of de-burring, finishing and polishing operations—jobs which formerly have been done by laborious hand filing, scraping and sanding.

All three types possess a relatively soft and flexible bond that imparts a cushion-like action, assuring a smooth uniform finish. They are designed to remove only a relatively small amount of material such as a burr or sharp edge, or to polish a surface that is already to size. Each wheel has its own field.

The fiber resinoid wheel consists of uniformly sized abrasive grains mixed with cotton fibers and held together with a resinoid bond. The mixture is pressed to the desired size of wheel or stick whereby light tool marks resulting from milling, boring and offhand grinding operations can be polished out quickly without danger of leaving the part undersized.

The resilient rubber type wheels are made with a comparatively soft rubber bond which imparts to the wheel a cushion-like cutting action. Made in three grades, these wheels can be operated at 3000 to 6000 sfpm.

Cork resinoid wheels are made up of abrasive, resinoid bond and finely divided cork, the latter providing a soft polishing action. They are used for many offhand polishing jobs and are also suitable for precision polishing work in grinders.

INFORM-A-GRAM KEY No. 545.5-T

Don't Send a Gang . . . *Carry Things On*

PORTELVATOR

(Portable Elevating Table)

A money-saving "quick change artist" for all sorts of things in your plant . . . for carrying, for lifting, for work bench, for overhanging work, etc. Write for details about new models.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

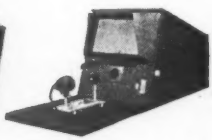
NEW UNIVERSAL GREENFIELD GRINDER SPEEDS TOOL AND CUTTER GRINDING

The rugged GREENFIELD No. 4 Tool & Cutter Grinder is serving industry as an invaluable production and toolroom machine. The spindle design of the new and improved GREENFIELD Wheel Head incorporates generous bearing areas—scraped to fit and thoroughly run in. Quickly and easily set up attachments provide toolroom versatility for grinding formed cutters, taper and rose reamers, flat surfaces and compound angles. Send for detailed and illustrated job application bulletin.

PRODUCTION MACHINE CO.
GREENFIELD, MASS.

As used vertically

As used horizontally



FS Optical Contour Comparator

Checks small parts quickly, accurately

For fast, detailed visual inspection of small intricate shapes such as gauges, dies, gears, parts of instruments, etc., checking height, width, thickness, radius, etc.

Used in either horizontal or vertical position. The Comparator's powerful aspheric condenser system and special lens produce an instantaneous accurate screen projection with a definite magnification of 13x, 25x and 50x. Other magnifications on special order. Convenient; compact.

Write today for Bulletin OC-292.

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Fish-Schurman

Actual Size Photo
3 Carat Size—Common
½" Shank—$36.00 ea.

DIAMONDS *for Production*

RE-SET-ABLE • BIG-HED-NIB

(Trade Marks Registered)

LOC-KEY-SET
by Patented Process
U. S. Pat. 2,331,741

16
Factory Branches
Jobbers
Everywhere

- **RE-SET-ABLE** adds to life of your diamond . . . More work per carat. Exclusive patented setting is tender to the diamond . . . Holds firmly . . . Protects from damage . . . Guards against breakage.

No. 24 CN RE-SET-ABLES are now selling in 100 lots. Ask for easy No. 4 Catalog and Grinder's Instruction Card. Shows sizes to fit your machines. Tools backed by service unequalled.

All diamonds are LOC-KEY-SET for immediate shipment . . . Tools numbered in units of ¼ carat (No. 1 size) and lettered to denote quality of diamond and style of mounting . . . 3 grades — Common (C), Medium (M), Select (S). (24-hour resetting service $1.00 postpaid.) Bigger stones in C grade are genuine economy in diamond use. For large wheels we recommend No. 60-CN.

Equip Now with "RE-SET-ABLE" Diamond Tools on Your Precision Grinding Production Line

DIAMOND TOOL COMPANY, Not Inc. SHELDON H. SOUTH, Pres. 938 E. 41st Street - CHICAGO 15, Ill.

REMOVABLE REAMER BLADES

. . . may be resharpened 8 to 10 times—replaced when necessary . . . . finish holes mirror-smooth — fast and accurately.

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DUAL SPIRAL FLUTES

★ Eliminate Honing
★ .035" to .080" Expansion
★ Extensions for Line Jobs
★ Reams Smoothly Over Split Bushings

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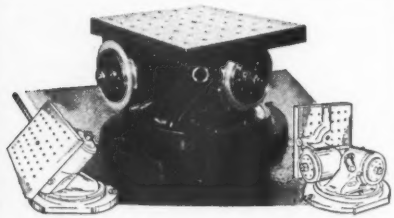
526 SO. MAIN STREET
NEW LEXINGTON, OHIO
Established 1918



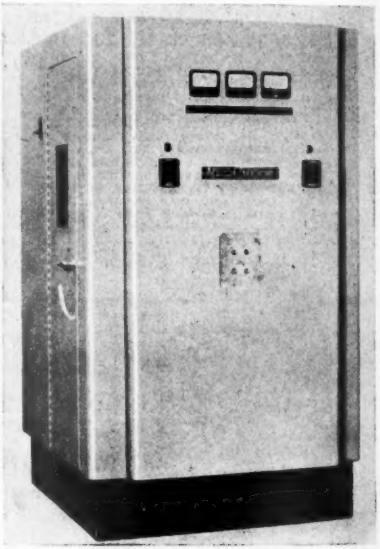
Universal Compound Angle Plate

Saves about 50% of time formerly consumed in set-up of work. Can be used on milling machine, shaper, jig borer, drill press, etc., to lay out, machine, and check work without removing work from plate. Can also be used as a 90° angle plate on the machine or on the surface plate. Holds work in any position from 0° to 90° in two planes, 90° apart, and in any position within 360° of the radial axis. The surface plate, from a position parallel to the base, may be tilted 90° in two directions and also rotated 360° on the base. Each of three protractors (two 5" and one 10" diameter) are calibrated to 1 minute and accurate within 10 seconds of the arc. Write for Bulletin No. 4. Angle Computer Co., 5720 Melrose Ave., Los Angeles 38, Calif.

STUDLER ANGLE COMPUTER

25 KW Megatherm Induction Heating Unit

A new 25 KW Megatherm Induction Heating Unit has been introduced by the Industrial Electronics Division, Federal Telephone and Radio Corporation, Newark, N. J., manufacturing associate of International Telephone and Telegraph Corp. The unit is particularly adapted to high speed induction surface hardening of such parts as bearing surfaces,



cam faces and gear tooth contours—also to the broad field of brazing and silver soldering.

The unit is designed to deliver 25 KW of output continuously at frequencies adjustable within a 2-5 million cycles per second range and makes possible the speedy heating of brass, copper and aluminum alloy pieces as well as steel parts. The 25 KW Megatherm measures 4' x 4' x 7' and is one of a complete line of induction heating and dielectric heating units manufactured by Federal Telephone and Radio Corporation.

INFORM-A-GRAM KEY No. C55-T

HARTLEY

TUNGSTEN CARBIDE

Special DIES *Shaped*

No need to worry about facilities for fast and reliable production of special-shaped dies—that's the specialty of the Hartley Wire Die Company.

Skilled workmen combined with extreme manufacturing care and most critical inspection assure you dies of the high quality you require, and the prompt service you desire.

"From blueprint to finished product"—that's Hartley service. Just send us the prints of the dies you require; no problem is too tough, no job too large or small. Every assistance we can give is yours.

HARTLEY WIRE DIE CO

14 ELM STREET THOMASTON, CONN.

SAFETY "WEDGE GRIP" STEEL HAND STAMPS

Pat. No. 2,089,794

Ideal for mass production markings of defense products . . . trade marks and symbols. Any size or number of characters available.

Write for Literature

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SAFETY STEEL STAMPS

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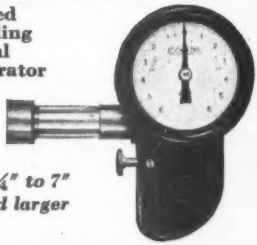
Help Prevent an Accident Today!

"Matched Gaging" to fractions of .0001" with

COMTORPLUG

Patented Expanding Internal Comparator



Sizes: ¼" to 7" dia. and larger

By combining high precision with unique simplicity, Comtorplug enables operators, bench inspectors and final inspectors to use the same gage, improving quality and lowering rejects. Shows actual size; detects out-of-round, front or back taper, barrel shape, bell mouth, etc.

Request Bulletin 29

THE COMTOR CO.

82 Rumford Ave. Waltham, Mass.

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DESIGNERS AND MANUFACTURERS OF DIES · TOOLS · GAUGES · JIGS AND SPECIAL MACHINERY

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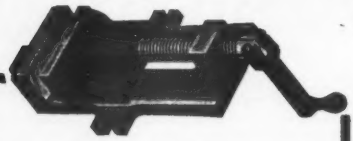

YOST DRILL PRESS VISE

This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
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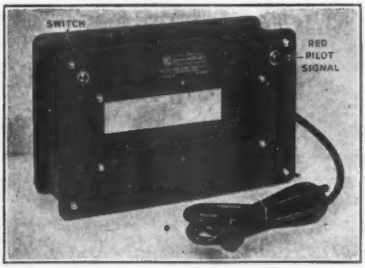
AMC DEMAGNETIZER

A Tool Room Necessity



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

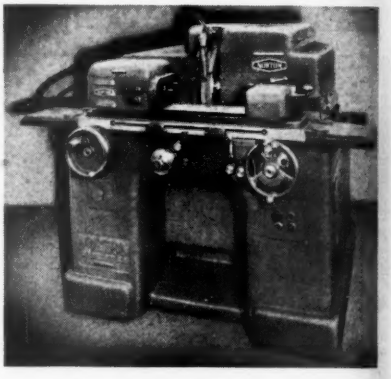
Available for either 115 V. or 220 V.

Write for full information.

ALOFS MFG. CO.
1619 Madison Ave., S. E., Grand Rapids, Mich.

Norton 4″ Type C Cylindrical Grinder

The Norton Company, Dept. T, Worcester, Mass., has added to its line of grinding and lapping machines the new 4″ Type C Cylindrical Grinder. Available in 12″ and 18″ lengths this machine is primarily designed for short length, small diameter work. All controls and



adjustments for this high production precision grinder can be quickly and easily made by the operator.

The machine should prove particularly valuable in the airplane, automotive, and instrument parts industries, and especially to manufacturers of small machine parts where high production will be essential to meet postwar competition.

Outstanding features of this grinder include: hydraulic table traverse, automatic infeed of the wheel with each table reversal, and an adjustable dwell at each end of the table traverse. The new machine is available as plain or semi-automatic and with manual or automatic cycle. Continuous wheel feed can be furnished where the semi-automatic model is specified.

Work speeds are from 100 to 1000 rpm. Grinding wheels 16″ in diameter and up to 3″ wide are available for this machine. Other features include Norton wheel spindle with automatic coolant controls. Maximum floor space occupied by the longer machine is approximately 75″ long by 55″ wide.

INFORM-A-GRAM KEY No. 545-T

"STAR DUST"

LABORATORY GRADED

PURE DIAMOND POWDERS

STAR DUST speeds up production enormously and produces finishes and superfinishes down to less than .0000004 of an inch.

Precision LAPPING POWDERS for PRECISION work

For GAUGES, TOOLS, DIES, etc., with tremendous TIME SAVING. These factors make STAR DUST indispensable in lapping and superfinishing on HARDSTEELS, TUNGSTEN CARBIDE, CHROME.

- Absolute control of particle sizes
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There is a STAR DUST Field Servicemen in your territory.

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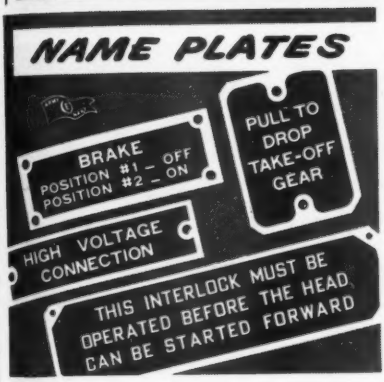
NAME PLATES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POSITION #1 _ OFF
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PULL TO DROP TAKE-OFF GEAR
HIGH VOLTAGE CONNECTION
THIS INTERLOCK MUST BE OPERATED BEFORE THE HEAD CAN BE STARTED FORWARD

Modern Messengers in

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Name plates, dials, scales, panels. Eastern Etching's prompt deliveries help speed your war production. Normal deliveries —Two Weeks. AAA orders—48 hours. Tool checks, data & instruction plates, dials, scales, instrument panels, etched & lithographed products. *For complete details write—*

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Alloy Steels For Victory

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

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A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.

The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in 3/16" to 1" diameters.

Send for price list.

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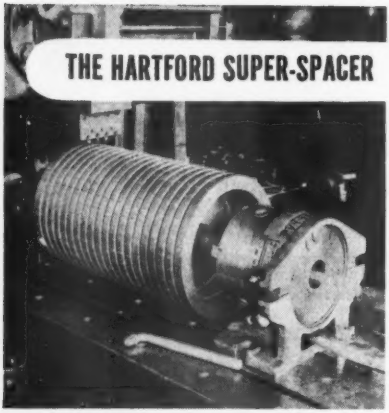


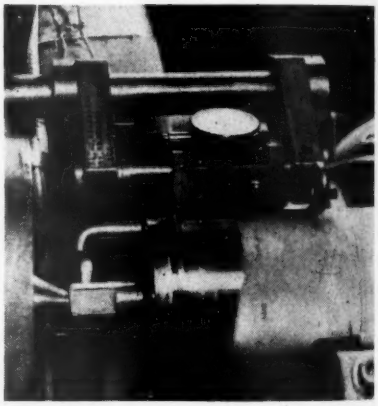
★ The Hartford Super-Spacer drastically reduces setup time. The Master Index Plate insures toolroom accuracy. Speeds and Feeds are limited only by power of the machine and the capacity of the holding means. Circular illustrating numerous applications is available on request.

THE HARTFORD SPECIAL MACHINERY CO.

Carbide Fingers Insure Accurate Gaging During Grinding

Use of carbide gage fingers has insured accurate gaging during grinding at a large aircraft engine plant in Detroit, under conditions which would wear steel fingers away so rapidly that the operator would be forced to continually re-set his gage.

The job where these fingers are used consists of grinding the O.D. of aircraft



cylinder sleeves to extremely close tolerances. The gage fingers—made of Carboloy cemented carbide where they contact the rotating work—are so set that when the gage reads "0" they automatically shut off the machine feed, thereby saving an appreciable amount of time on long production runs.

Since no lubricant can be used on these gage fingers for obvious reasons, it is impractical to employ steel for this purpose since steel would wear away so rapidly that the operator would be forced to continually re-set his gage to maintain accuracy. The Carboloy fingers, however, stand up under these conditions and are reported to have made this type of gaging fixture practical with a resultant material increase in production.

INFORM-A-GRAM KEY No. 82.5-T

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BAND AND DISC GRINDER

The latest in pedestal type grinders. Actually two machines in one! 14″ disc for all rough work . . . 6 x 48″ band for finishing. Precision-built to meet wartime production standards — quickly, economically!

Other styles and sizes in New Booklet on Finishing—Write Today

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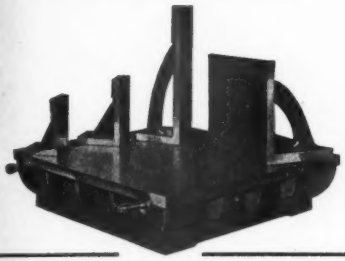
MILWAUKEE
Surface Plates



A full line of surface plates, angles and box parallels. Standard plate sizes from 8″x 8″ to 48″x 96″, larger sizes with or without legs. Plates are finish-planed and scraped to insure a very accurate surface.

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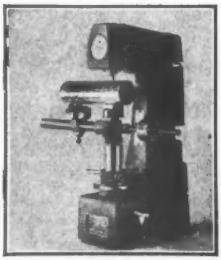
HARDNESS TESTER



Many standard work support accessories are available, the latest being a fixture for the Jominy End-Quench Hardenability Test described in Bulletin E-44.

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MECHANICAL INSTRUMENT CO., INC.
An Associate Company of American Chain & Cable Company, Inc.

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These cutters have the simplicity of design and sturdiness of construction that are characteristic of Lewthwaite tools. Over fifty years of experience are behind them.

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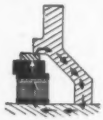
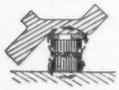


THIS IS NEW

The arrows indicate the path of the magnetic flux in the new



Power Grip Magnetic Chucks

Uneven or odd shaped pieces are held as shown with plain steel blocks (the black blocks are solid).

These chucks have often returned their cost, by holding work without expensive jigs or fixtures, on one job.

Furnished complete ready to plug into 110 volt A. C. lighting circuit, with reversing control. Nothing more to buy. Complete unit easily portable. GUARANTEED.

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This is no time for machines to stand idle, while good tool makers rummage through the scrap heap for setting-up materials or waste vauable time fashioning makeshift setting-up devices. Equip all planers, shapers, milling machines, drill presses and special machines with ARMSTRONG SETTING-UP TOOLS—Planer Jacks, Bracing Jacks, "T"-Slot Bolts and Drop Forged Strap Clamps that reduce setting-up time to a minimum, hold work and jigs rigidly, prevent delays, accidents and spoilage and stand up for years.

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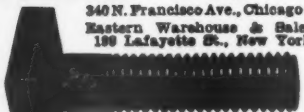
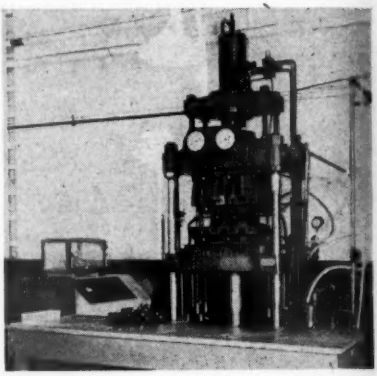


Write for Circulars

New Baldwin Press Demonstrates Economies

Operating information on a new vertical hydraulic "hyspeed" press, recently made public by The Baldwin Locomotive Works, Philadelphia 42, Pa., reveals that remarkable economies in production time have been effected. Electronic or radio frequency preheating of preforms was utilized.

Experiments were conducted in The Bryant Electric Company's Hemco plant



in Bridgeport, Conn. The 2-kilowatt preheating unit used in the experiments was built by the Electronic Division of the Westinghouse Electric and Manufacturing Company. The Monsanto Chemical Co., Plastics Division, Springfield, Mass., furnished the resins, ureas and melamines, for the experiments. All three of these companies cooperated with Baldwin's Southwark Division according to Ralph Kelley, president of The Baldwin Locomotive Works, who made the announcement

The special molds for the experiment were built under the direction of Charles J. Smith, head of the Plastics Division of the Bryant Electric plant. He states that high frequency heating resulted in radical reduction of curing time, that an operator was able to turn out 20 percent more pieces from an experimental 6-cavity mold than were previously turned out from a standard 24-cavity compression mold. Smith estimates the saving in mold cost alone at $6,000 in

When "specs" call for holes from .004 to 5/16" dia.

Intricate, precision-accurate drilling in quickest possible time and most dependable positioning.

For aircraft, Diesel, laboratory and other intricate drilling.

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The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

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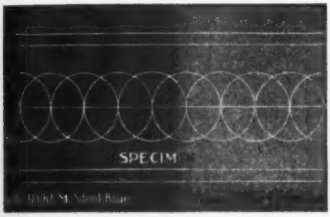

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"SUPER-SPEED" Pneumatic
GRINDER

A 100,000 R.P.M. UNIT

The only hand grinder with spindle speed of 100,000 R.P.M. on 100 pounds air pressure. It has revolutionized hand grinder performance. Can be directed in any working position; operates with extreme ease. Steel construction throughout. Formed to fit the hand. Weighs only 14 ounces . . . *Write for Circular.*

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Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability—since 1812.

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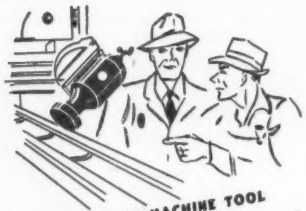

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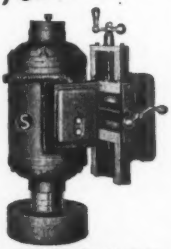

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TOOL STEEL

FOR 1945
—Win the War.
—Win the Peace.
The Good Tool Steel tools that made possible war production are ready for the increased peace-time needs.
It pays to use Good Tool Steel.

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MAIN OFFICE AND WORKS
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addition to a 12½ percent saving in material.

With such a unit, the following savings are effected:

1. A smaller press is required, reducing the initial investment.
2. A smaller mold will be required, reducing the initial investment, as well as reducing maintenance cost.
3. Due to the reduction of pressure on the material molded, the mold life will be considerably longer; in addition materials that can be hobbed more readily can be used for mold construction.
4. Molded pieces can be made faster.
5. There is a decided saving in "flash", or waste material and rejects.
6. Savings will be shown in cost of raw materials due to the possibility of using substitutes or cheaper materials.
7. There is a considerable saving in finishing, since there is practically no flash on cutting edges or in holes.

In the experiments, one man operated both the press and the 2-kilowatt high frequency unit. The preforms were placed in the electronic unit. The heating takes only a few seconds after which the operator lifts out the hot preforms, places them in the mold and manually closes the mold. The closed mold pressure of 12,000 psi is held only a few seconds, the press opened and the completed parts are removed.

It is believed that molded products may be made from phenol or urea materials with a favorable comparison in cost.

C. L. Miller, Westinghouse electronic engineer who participated in the joint experiment, summarizes the advantages of a high frequency unit to preheat the preforms, "because the heat is established inside the preforms as quickly as the outside, there is no opportunity for the outer portion to overcure before the inside gets hot. Because the preforms go into the mold hot, much lower pressures can be used. This means smaller presses. It is estimated that as a result of lowered pressure for a particular job, the press would cost approximately one-third of a straight compression press; that maintenance costs will be reduced to a fifth and the molds will have 30 percent longer life. Molded pieces can be made 20 percent faster, with 12½ percent saving in material, and require much less subsequent finishing."

Sensational new

DRILL SHARPENING GUIDE!

Patent Applied For

EVERY MAN can now sharpen a drill right like a veteran mechanic—with help of this new device.

SAVES TIME—PATIENCE and DRILLS

GET this new device, learn to use in 10 minutes, grind drill right first time and watch drill cut through steel or iron like you've always wanted to!

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Direct Reading Accurate, Fast, Simple. New timely tool SAVES TIME, SPEEDS UP PRODUCTION. Graduated scale, easily read at a glance. Adaptable to all types, shapes of work, wood or metal. Measures 0 to 4 inch.

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QUESTION

What flexible shaft machine will best do the job we want?

ANSWER

Ask for the WYCO Catalog There's a WYCO Flexible Shaft Unit for every requirement—for every plant situation.

Whatever your need—from a Heavy Duty 3-phase motor, selective speed grinder down to a light duty 1/10 HP 18000 RPM Universal grinder—there is a complete range of WYCO Flexible Shaft Equipment to satisfy every production requirement. Floor, bench, suspension, truck, jack shaft, or radial type mountings.

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Only WYCO Flexible Shafts have the WYCO Patented Non-Metallic Innerliner. Makes the Core last longer—Run Smoother —Transmit more power.

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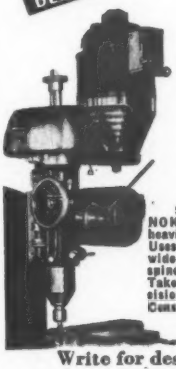
MILLING - DRILLING - BORING ATTACHMENT for Heavy Duty Operations

PROMPT DELIVERY



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Large Quill

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6 SPEEDS

250-3000 RPM

Lever and Worm Feeds

½ H. P. Motor

Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes ⅛" to ¾" end mills. Precision Engineered and Ruggedly Constructed Throughout.

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To meet production needs of every type, HARGRAVE Individually Tested Clamps are built in a wide range of sizes and patterns. As a result, workmen find that jobs, ordinarily difficult to perform, are easily handled with HARGRAVE Clamps.
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See Your Supplier
THE CINCINNATI TOOL CO.
Founded in 1879
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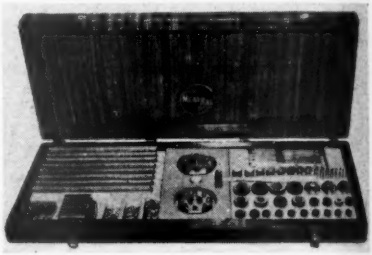
The CINCINNATI TOOL Co.

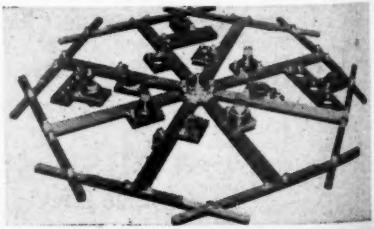
Borlocator Radial and Box Jig Fixtures

An important addition to the tooling that can be performed with the "prefabricated" jig and fixture components making up the "Borlocator Method" has recently been announced by Steel Tools, Inc., of Cleveland, whereby layouts for drilling purposes can be made up to a 24" diameter.



This is accomplished by use of the Model B circular layout set of Micro-King Borlocators that includes a hexagon and octagon spider to which as many as 8 location plates may be attached in a hexagon or octagon spacing. The limitation on the minimum diameter is 7" on a hexagon layout and 8" on an octagon layout. Any radial layout can be obtained where off-set holes are required along with the hexagon and octagon spacings, by use of the locating plates from the Model A set which is for rectangular and flat surface layouts.

The Borlocator is a highly flexible standardized tooling set-up frequently costing less than a single special precision jig or fixture. It can be set up



BRAND GUARANTEED PRECISION TOOLS

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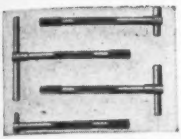
are precision ground—all parts subject to wear are hardened—ground to proper radius.



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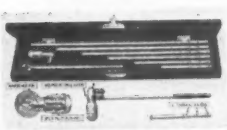

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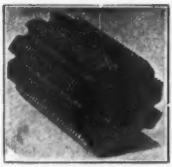

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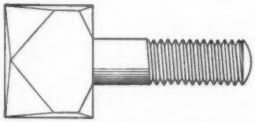

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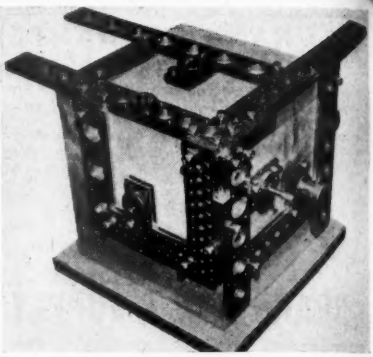

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(for obtaining, see page 156)

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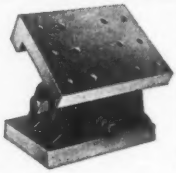

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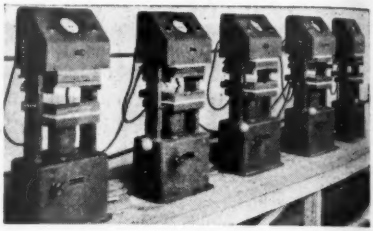

mold wood, paper and plastics, and has been proved useful in compression molding of synthetic rubber and small rubber parts, as well as in powder metallurgy.

A considerable number of large war plants are also using the Preco press to turn out laminated identification cards and badges, in their research laboratories, and in some manufacturing processes.

Standing only 27½ inches high and weighing only 200 lbs., the Preco press has a 750-watt heating element cast into each 8" x 8" platen. The platens are self-leveling, making adjustments unnecessary. The press is equiped with dual thermostatic controls for accurate temperature adjustment and precise heat control. A specially designed and patented 2-stage hydraulic pump provides rapid closure of the platens to the point of contact, then automatically shifts to low speed until desired pressure is reached. Another noteworthy feature of the press is its high pressure range—up to 40,000 lbs.

This well-designed press has been found to be most efficient in speeding up line production. The Selenium Corporation of America, for example, started with an original installation of four Preco presses, and found them so valuable an aid in manufacturing that they have since added six more of the presses.

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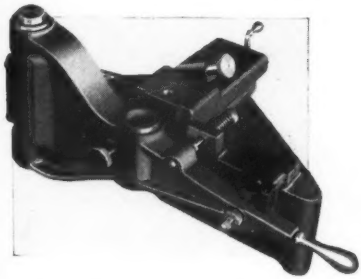

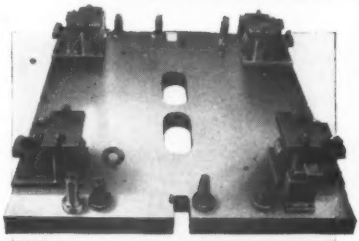

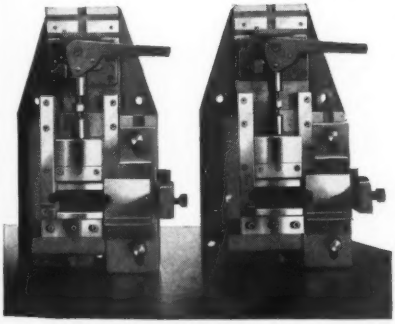

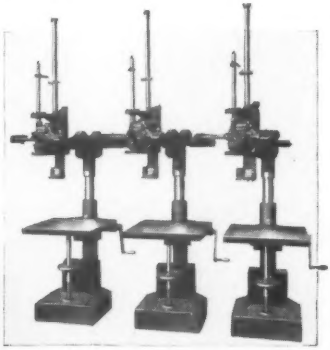

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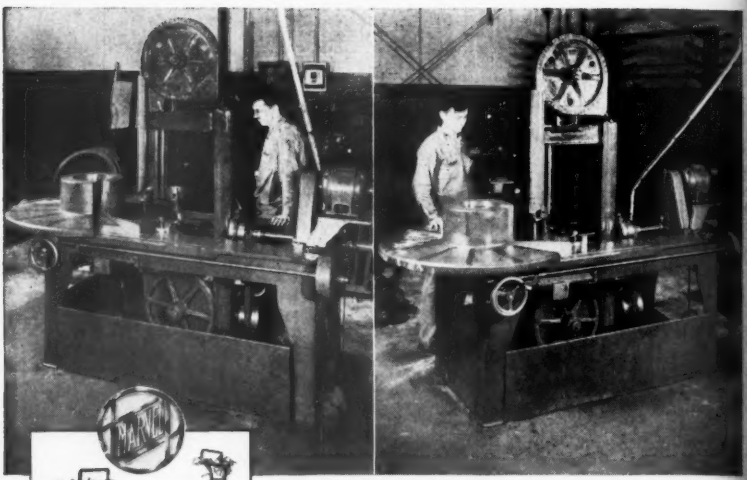

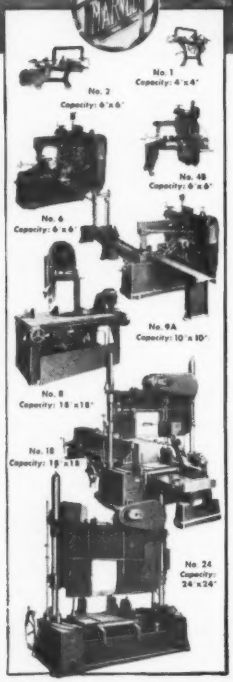

The No. 8 MARVEL Band Saw Does the "Impossible"

This "impossible" job required the cutting into 12 equal sections of a cast steel ring 42" in diameter. The ring was to be an expanding chuck for stretching and sizing automobile tire rims. Each ring weighed 750 pounds, the length of the cut was 15" and the thickness of the material at the hub was over a foot in thickness. The sectioning of this ring with ordinary equipment was "impossible" because of the high cost involved and the special handling fixtures needed.

The Chicago Gear Mfg. Company, with several MARVEL Saws, including a No. 8 Band Saw, could take this job because they knew that with the Universal MARVEL No. 8 and its broad planer-type bed no special setting-up fixtures or tools would be necessary and that their regular saw operator could service the machine without interfering with his regular work. The MARVEL No. 8 handles all work up to 18" x 18" cross section and does cutting-off, mitering and notching. The blade feeds into the work at any angle from 45° right to 45° left. It is the most versatile metal-cutting saw built.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

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MARVEL SAWS